

EXHIBIT 1

**UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

SOLAS OLED LTD.,

Plaintiff,

Case No. 2:19-cv-00152-JRG

v.

SAMSUNG DISPLAY CO., LTD., et al.,

Defendants.

**PLAINTIFF SOLAS OLED LIMITED’S DISCLOSURE OF
ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS**

Pursuant to P.R. 3-1 and P.R. 3-2, patent owner Solas OLED Limited hereby provides its disclosure of asserted claims and infringement contentions and its accompanying document production. This disclosure is based on the information available to Solas as of the date of this disclosure, before Solas has received any discovery on the design or operation of the defendants’ products. Solas reserves the right to amend this disclosure to the full extent permitted under the court’s rules and orders.

**I. P.R. 3-1: DISCLOSURE OF ASSERTED CLAIMS AND
INFRINGEMENT CONTENTIONS**

A. P.R. 3-1(a): Asserted Claims

Solas asserts that defendants Samsung Display Co., Ltd.; Samsung Electronics America, Inc.; and Samsung Electronics Co., Ltd. (collectively “Samsung”) infringe one or more of the following claims, directly, by inducement, by contributory infringement:

<i>U.S. Patent No.</i>	<i>Asserted Claims</i>
6,072,450	1, 3–6, 8, 12, 13, 15, 16
7,446,338	1, 5, 6, 9, 10
9,256,311	1, 2, 4–8, 10–13, 15, 16, 18–20

Collectively, these three patents are referred to herein as the Asserted Patents, and these claims as the Asserted Claims.

B. P.R. 3-1(b): Accused Instrumentalities of Which Solas Is Aware

In this section, Solas provides lists of accused products that Solas is aware of infringing based upon information presently available to it and its investigation to date. Solas's infringement claims are not limited to these listed products and specifically extend to all products and apparatuses of Samsung similar to the listed products that include the claimed elements. Unless otherwise stated, Solas's infringement assertion apply to all variations, versions, editions, and applications of each of the listed products.

1. U.S. Patent No. 6,072,450

Solas accuses the following Samsung products that it is presently aware of infringing each of the Asserted Claims of the '450 patent:

Samsung Galaxy S4
 Samsung Galaxy S5
 Samsung Galaxy S6
 Samsung Galaxy S6 Edge
 Samsung Galaxy S6 Edge+
 Samsung Galaxy S7
 Samsung Galaxy S7 Edge
 Samsung Galaxy S8
 Samsung Galaxy S8+
 Samsung Galaxy Note 3
 Samsung Galaxy Note 3 Neo
 Samsung Galaxy Note 4

Samsung Galaxy Note Edge
Samsung Galaxy Note 5
Samsung Galaxy Note 7
Samsung Galaxy Note 8

In addition, Solas accuses the Organic Light-Emitting Diode (OLED) displays made and sold by Samsung and utilized in the following third-party products that it is presently aware of infringing each of the Asserted Claims of the '450 patent:

Apple MacBook Pro with OLED Touch Bar
Dell Venue 8 7000 series
Google Pixel
Google Pixel XL
Sony PlayStation VR

The Samsung products—and the Samsung displays contained in the third-party products—in the preceding two lists; all variations, editions, and applications of the foregoing; and all products and apparatuses of Samsung similar to the foregoing that include the claimed elements are the '450 Accused Instrumentalities.

2. U.S. Patent No. 7,446,338

Solas accuses the following Samsung products that it is presently aware of infringing each of the Asserted Claims of the '338 patent:

Samsung Galaxy S4
Samsung Galaxy S8
Samsung Galaxy S8+
Samsung Galaxy S9
Samsung Galaxy S9+
Samsung Galaxy S10
Samsung Galaxy S10+
Samsung Galaxy S10e
Samsung Galaxy S10 5G
Samsung Galaxy Note 8
Samsung Galaxy Note 9
Samsung Galaxy Note 10
Samsung Galaxy Note 10+

In addition, Solas accuses the Organic Light-Emitting Diode (OLED) displays made and sold by Samsung and utilized in the following third-party products that it is presently aware of infringing each of the Asserted Claims of the '338 patent:

Apple iPhone X
Apple iPhone XS
Apple iPhone XS Max
Apple iPhone 11 Pro
Apple iPhone 11 Pro Max
Google Pixel
Google Pixel XL
Google Pixel 3 XL
Google Pixel 3a
Google Pixel 3a XL

The Samsung products—and the Samsung displays contained in the third-party products—in the preceding two lists; all variations, editions, and applications of the foregoing; and all products and apparatuses of Samsung similar to the foregoing that include the claimed elements are the '338 Accused Instrumentalities.

3. U.S. Patent No. 9,256,311

Solas accuses the following Samsung products that it is presently aware of infringing each of the Asserted Claims of the '311 patent:

Samsung Galaxy S6 Edge
Samsung Galaxy S6 Edge+
Samsung Galaxy S7 Edge
Samsung Galaxy S8
Samsung Galaxy S8+
Samsung Galaxy S9
Samsung Galaxy S9+
Samsung Galaxy S10
Samsung Galaxy S10+
Samsung Galaxy S10e
Samsung Galaxy S10 5G
Samsung Galaxy Note 8
Samsung Galaxy Note 9
Samsung Galaxy Note 10
Samsung Galaxy Note 10+

The Samsung products—and the Samsung displays contained in the third-party products—in the preceding two lists; all variations, editions, and applications of the foregoing; and all products and apparatuses of Samsung similar to the foregoing that include the claimed elements are the '311 Accused Instrumentalities. The '450 Accused Instrumentalities, '338 Accused Instrumentalities, and '311 Accused Instrumentalities collectively are the Accused Instrumentalities.

C. P.R. 3-1(c): Claim Charts

Solas's analysis of Samsung's products and apparatuses is based upon information that is publicly available and based on Solas's own investigation prior to any discovery in this action.

While the publicly available information constitutes evidence of the methods and apparatuses used by Solas in the Accused Instrumentalities, direct evidence of the actual apparatuses and methods are at times not publicly available. Accordingly, these infringement contentions are based on the available public information, laboratory analysis and reasonable inferences drawn from that information.

Solas reserves the right to amend or supplement these disclosures for any of the following reasons (along with any other reason that may be permitted under the court's rules and orders):

- (1) Samsung provides evidence of the apparatuses and methods used in the Accused Instrumentalities;
- (2) The Asserted Claims may include elements that involve features that are implemented by hardware structures and logic and Solas's current positions on infringement are set forth without the benefit of access to Defendant's source code, schematics, drawings, or other proprietary specifications

or information, which cannot be obtained through publicly available information, for the Accused Instrumentalities. Therefore, it may be necessary for Solas to supplement its positions on infringement after a complete production of such proprietary specifications or information by Samsung;

- (3) Solas's position on infringement of specific claims will depend on the claim constructions adopted by the Court. Because said constructions have not yet occurred, Solas cannot take a final position on the bases for infringement of the Asserted Claims; and
- (4) Solas's investigation and analysis of Samsung's Accused Instrumentalities are based upon information made publicly available by Samsung and by Solas's own investigations. Solas reserves the right to amend these contentions based upon discovery of non-public information that Solas anticipates receiving from Samsung during discovery.

Attached as Exhibits A through C, and incorporated herein in their entirety, are charts identifying where each element of the Asserted Claims of the '450, '338, and '311 patents are found in the Accused Instrumentalities.

Unless otherwise indicated, the information provided that corresponds to each claim element is considered to indicate that each claim element is found within each of the different variations, versions, editions, and applications of each respective Accused Instrumentalities.

D. P.R. 3-1(d): Literal Infringement and Doctrine of Equivalents

With respect to the patents at issue, Solas contends that each element of each Asserted Claim is literally present. In the alternative, Solas contends that certain elements are present under the doctrine of equivalents, as set forth in its P.R. 3-1(c)

claim charts. To the extent that Samsung identifies elements of the Asserted Claims that it contends are not literally present in the Accused Instrumentalities, Solas contends that such elements are present under the doctrine of equivalents.

E. P.R. 3-1(e): Priority Dates

<i>U.S. Patent No.</i>	<i>Priority Date</i>
6,072,450	November 28, 1996
7,446,338	September 29, 2004
9,256,311	October 28, 2011

F. P.R. 3-1(f): Identification of Instrumentalities Practicing the Claimed Invention

Solas does not presently assert that its own apparatuses, products, devices, processes, methods, acts, or other instrumentalities practice the claimed inventions. Solas reserves the right to supplement this response should further investigation, discovery, or the court's claim construction rulings make such supplementation appropriate.

II. P.R. 3-2: DOCUMENT PRODUCTION ACCOMPANYING DISCLOSURE

A. P.R. 3-2(a) Documents

Solas is presently unaware of any documents that evidence any discussion with, disclosure to, or other manner of providing to a third party, or sale of or offer to sell, any of the inventions claimed in the patents in suit prior to their respective application dates.

A diligent search continues for documents, and Solas reserves the right to supplement this response.

B. P.R. 3-2(b) Documents

Solas is presently unaware of any documents that evidence the conception, reduction to practice, design, or development of the claimed inventions, which were created on or before the application dates of the patents in suit or priority date identified pursuant to P.R. 3-1(e).

A diligent search continues for documents, and Solas reserves the right to supplement this response.

C. P.R. 3-2(c) Documents

The file histories for the '338 and '311 patents may be found in Solas's production at SOLAS_SAMSUNG_0000001-SOLAS_SAMSUNG_0000970. Solas has ordered a copy of the file history for the '450 patent and is awaiting its delivery. Solas will supplement its document production when the '450 file history arrives.

Dated: October 7, 2019

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**ATTORNEYS
FOR PLAINTIFF,
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CERTIFICATE OF SERVICE

I certify that “Plaintiff Solas OLED Limited’s Disclosure of Asserted Claims and Infringement Contentions” and the exhibits thereto were served on October 7, 2019 by email sent to:

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EXHIBIT A

Solas OLED Ltd. v. Samsung Display Co., Ltd., et al., Case No. 2:19-cv-00152-JRG

EXHIBIT A: P.R. 3-1(C) CHART FOR U.S. PATENT NO. 6,072,450

Plaintiff Solas OLED Ltd. (Solas) provides this chart based upon information that is presently available to it. Solas has not had access to Samsung's confidential design documents or to other materials that may become available during discovery. Solas reserves the right to change or provide more detail to the infringement theories set forth below, based upon information that it learns during this case, subject to the Court's rules and orders.

Definitions:

The term '450 Accused Instrumentalities is defined in Section I.B.1 of Plaintiff Solas OLED Limited's Disclosure of Asserted Claims and Infringement Contentions.

Claim Element

'450 Accused Instrumentalities

1. A display apparatus comprising:

To the extent the preamble is deemed limiting, the '450 Accused Instrumentalities comprise a display apparatus. For example, the Samsung Galaxy S8 contains an OLED display panel:

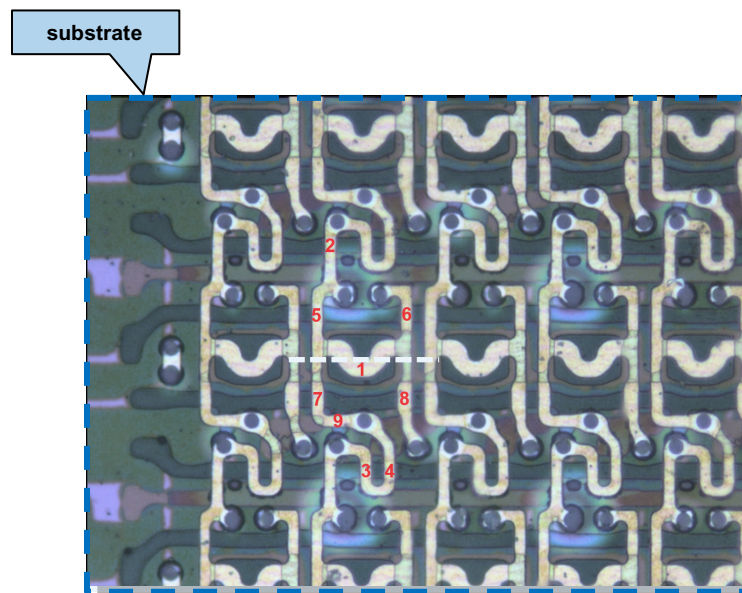


Claim Element

'450 Accused Instrumentalities

[1a] a substrate;

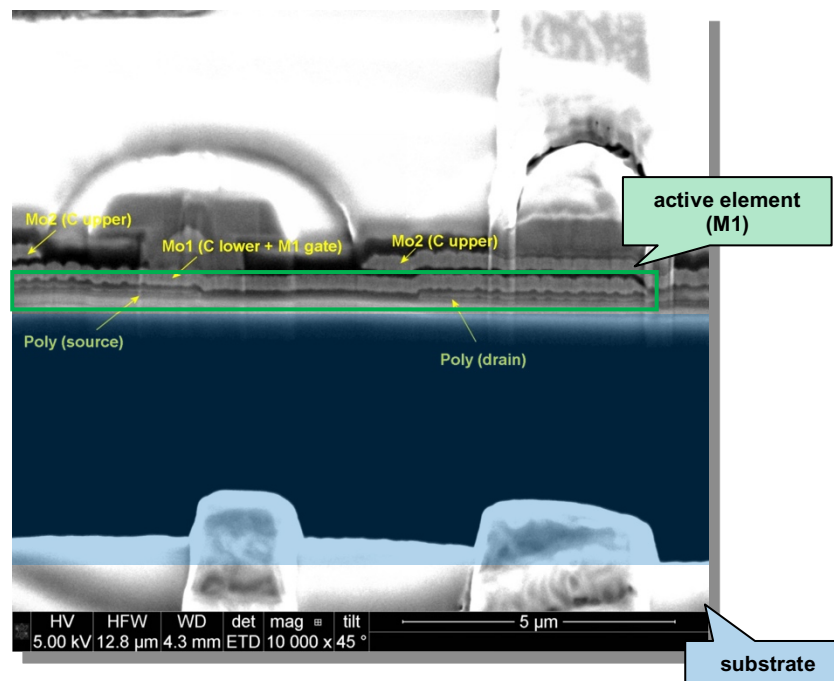
The '450 Accused Instrumentalities comprise a substrate. For example, the Samsung Galaxy S8 contains a polyimide substrate:



*Claim Element**'450 Accused Instrumentalities*

[1b] active elements formed over said substrate and driven by an externally supplied signal;

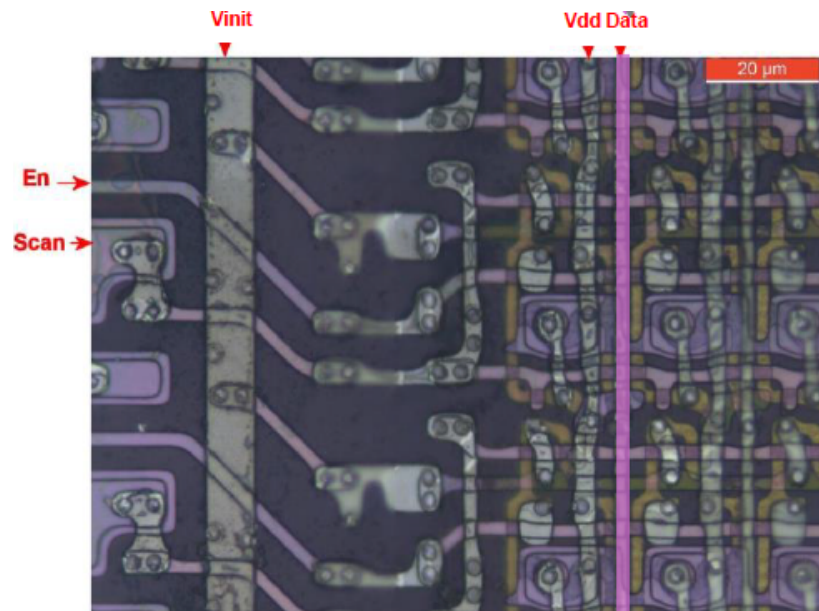
The '450 Accused Instrumentalities comprise active elements formed over said substrate and driven by an externally supplied signal. For example, the Samsung Galaxy S8 contains active elements formed over the substrate:



Claim Element

'450 Accused Instrumentalities

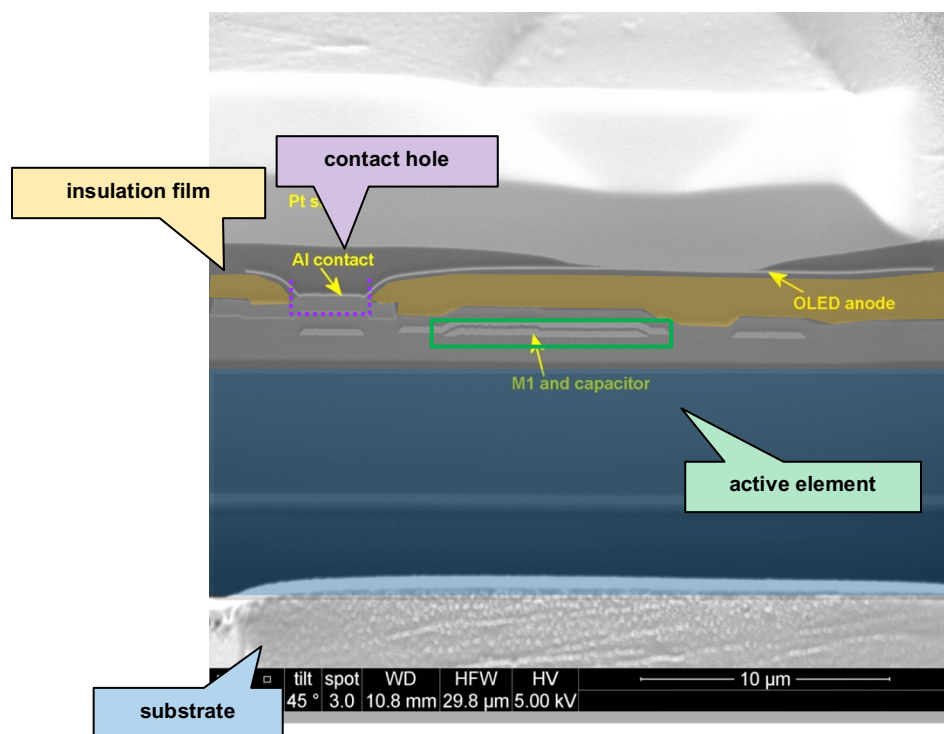
These active elements are driven by an externally supplied signal, labeled “Data” below:



*Claim Element**'450 Accused Instrumentalities*

[1c] an insulation film formed over said substrate so as to cover said active elements, said insulation having at least one contact hole;

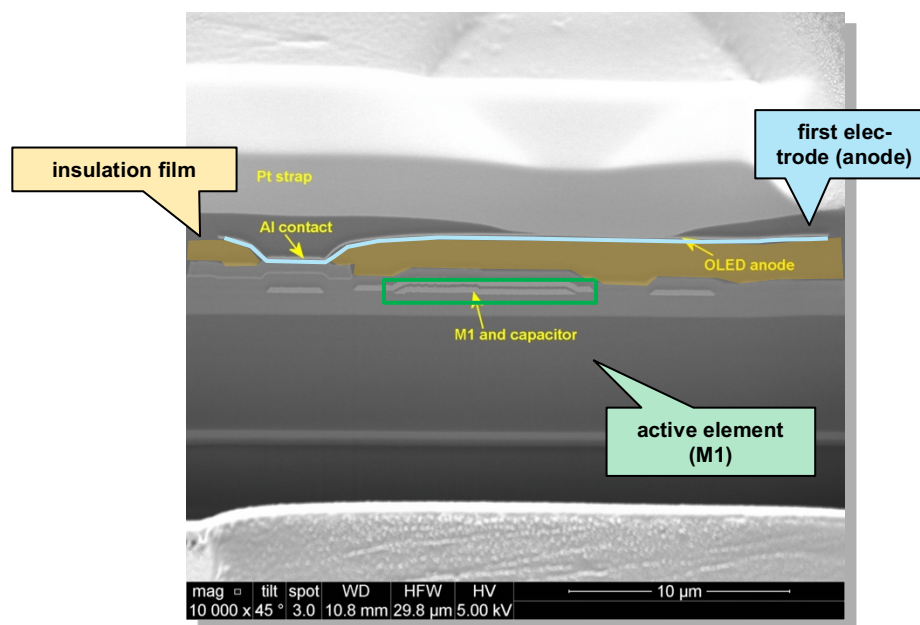
The '450 Accused Instrumentalities comprise an insulation film formed over said substrate so as to cover said active elements, said insulation having at least one contact hole. For example, in the Samsung Galaxy S8, an insulation film is formed over the substrate, covers the active elements, and has contact holes:



*Claim Element**'450 Accused Instrumentalities*

[1d] at least one first electrode formed on said insulation film so as to cover said active elements, and connected to said active elements through said at least one contact hole, said at least one first electrode being made of a material which shields visible light;

The '450 Accused Instrumentalities comprise at least one first electrode formed on said insulation film so as to cover said active elements, and connected to said active elements through said at least one contact hole, said at least one first electrode being made of a material which shields visible light. For example, in the Samsung Galaxy S8, an electrode is formed on the insulation film, covers active elements, and is connected to active elements through contact holes:



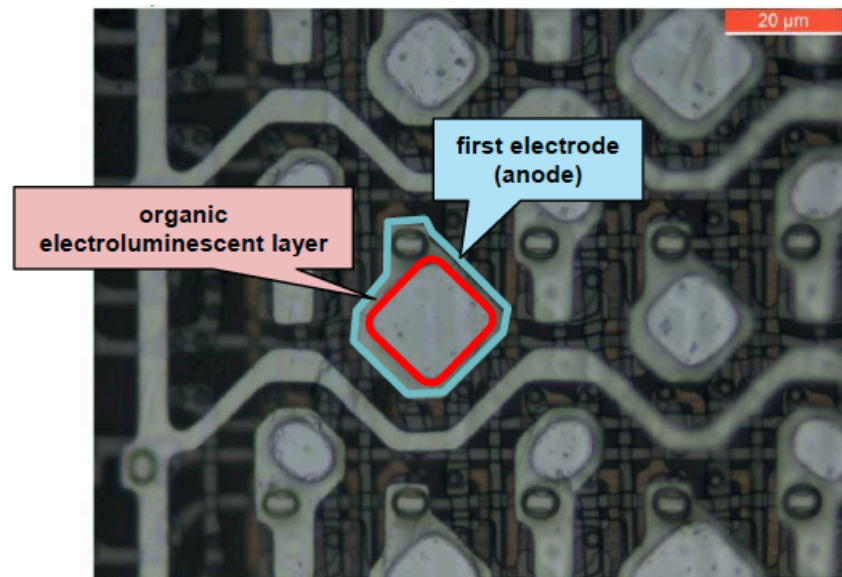
This electrode is formed of silver, which shields visible light.

Claim Element

[1e] an organic electroluminescent layer having an organic electroluminescent material formed on said at least one first electrode so as to cover said active elements and including at least one layer which emits light in accordance with a voltage applied to said at least one layer; and

'450 Accused Instrumentalities

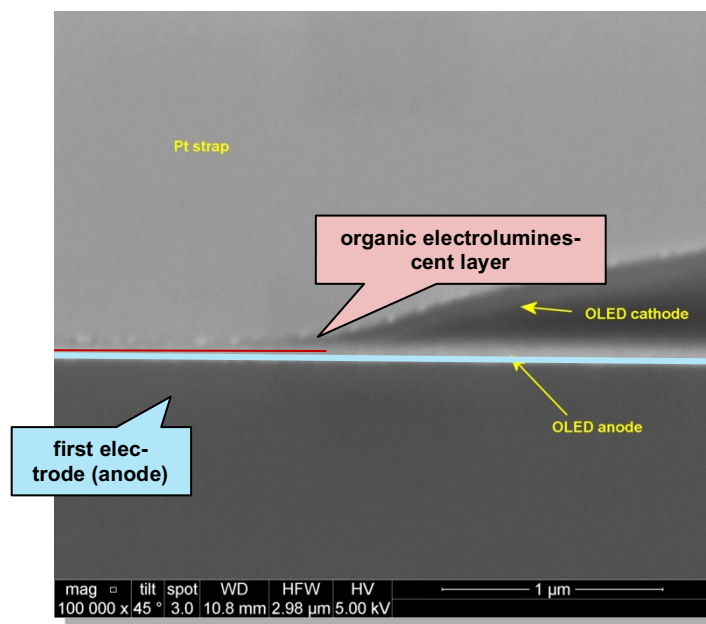
The '450 Accused Instrumentalities comprise an organic electroluminescent layer having an organic electroluminescent material formed on said at least one first electrode so as to cover said active elements and including at least one layer which emits light in accordance with a voltage applied to said at least one layer. For example, in the Samsung Galaxy S8, a layer of organic electroluminescent material is formed on the electrode, and covers active elements:



Claim Element

'450 Accused Instrumentalities

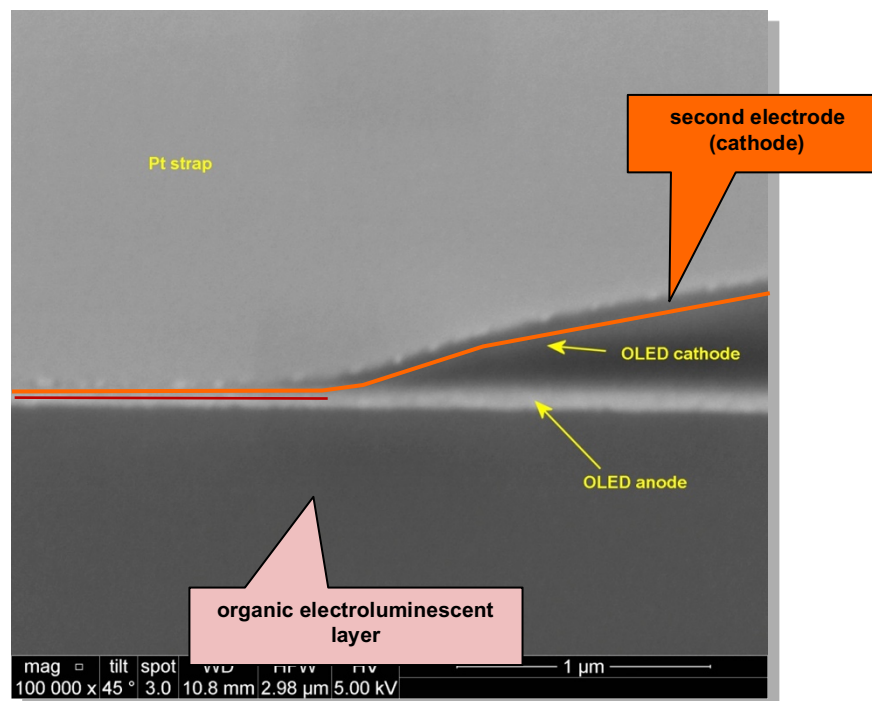
This organic electroluminescent layer emits in accordance with a voltage applied to the layer using the OLED cathode and anode:



*Claim Element**'450 Accused Instrumentalities*

[1f] at least one second electrode formed on said organic electroluminescent layer which covers said active elements.

The '450 Accused Instrumentalities comprise at least one second electrode formed on said organic electroluminescent layer which covers said active elements. For example, in the Samsung Galaxy S8, a second electrode is formed on the organic electroluminescent layer:

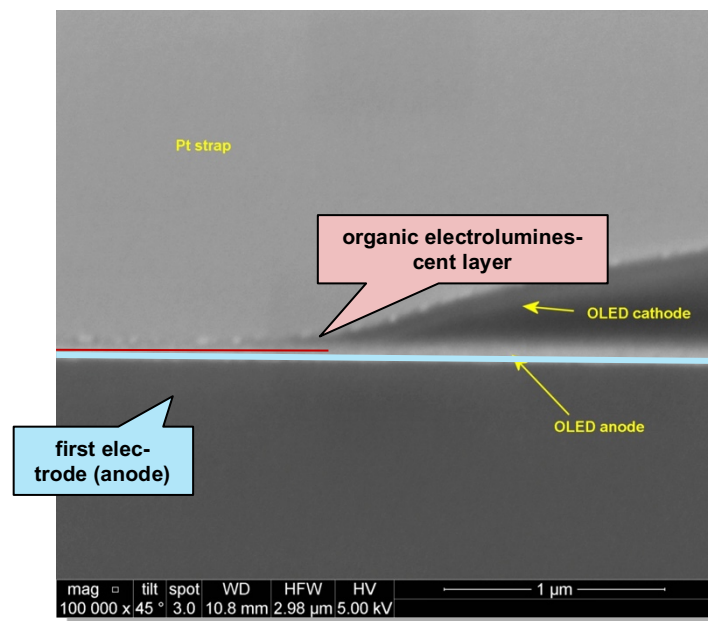


Claim Element

3. The display apparatus according to claim 1, wherein said at least one first electrode has a rough surface which is in contact with said organic electroluminescent layer.

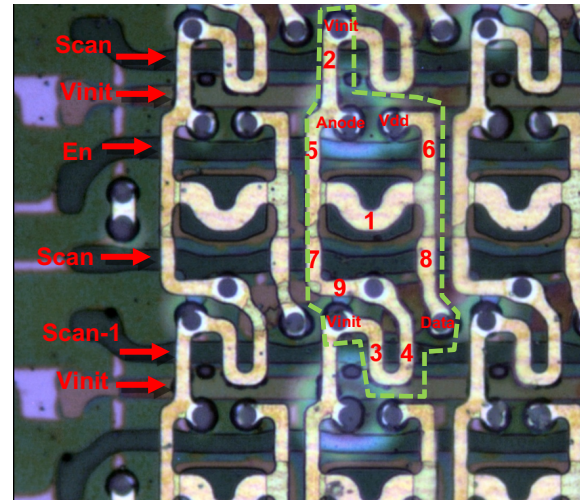
'450 Accused Instrumentalities

The '450 Accused Instrumentalities comprise a display apparatus according to claim 1, wherein said at least one first electrode has a rough surface which is in contact with said organic electroluminescent layer. For example, in the Samsung Galaxy S8, the first electrode has a rough surface which is in contact with said organic electroluminescent layer:



'450 Accused Instrumentalities

The '450 Accused Instrumentalities comprise a display apparatus according to claim 1, wherein said active elements are a selection transistor which is turned on in response to an externally supplied address signal corresponding to image data supplied externally through said selection transistor while said selection transistor is on, for controlling a voltage to be applied to said organic electroluminescent layer, said selection transistor and said drive transistor forming a pair. For example, in the Samsung Galaxy S8, the active elements include a selection transistor (see, for example, labels 7 and 9 below) and a drive transistor (see, for example, label 1 below):



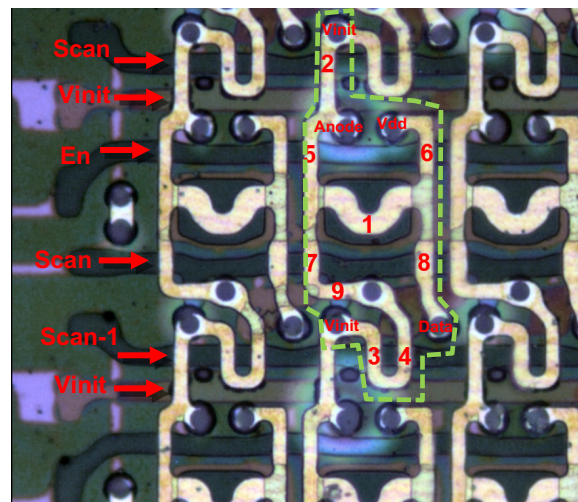
11

*Claim Element**'450 Accused Instrumentalities*

To the extent that Samsung contends elements labeled 7 and/or 9 in the image above do not literally satisfy the “selection transistor” element, that element is present under the doctrine of equivalents. To the extent that Samsung contends the element “said active elements are . . .” is not literally present in the accused products, that element is present under the doctrine of equivalents.

5. The display apparatus according to claim 4, wherein said at least one first electrode is connected to said drive transistor through said at least one contact hole.

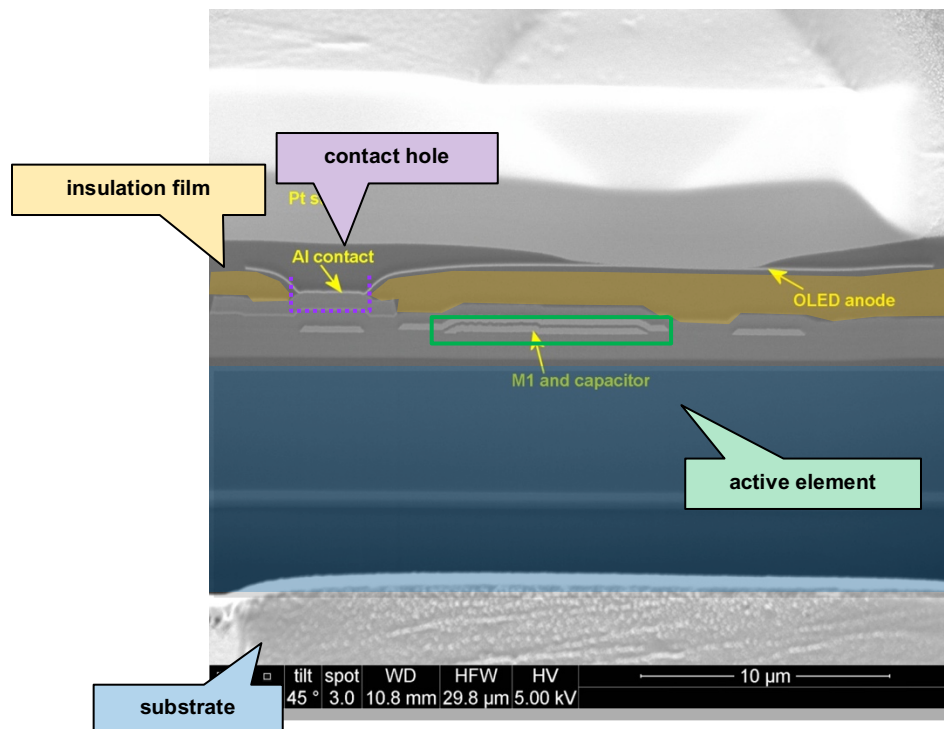
In the '450 Accused Instrumentalities, the at least one first electrode is connected to said drive transistor through said at least one contact hole. For example, in the Samsung Galaxy S8, the first electrode is connected to the drive transistor (see, for example, label 1 below) through a contact hole (see, for example, label “anode” below):



*Claim Element**'450 Accused Instrumentalities*

6. The display apparatus according to claim 4, wherein: said display apparatus further comprises a capacitor for retaining the signal corresponding to the image data externally supplied through said selection transistor while said selection transistor is on; and while said selection transistor is off, said drive transistor is driven by the signal retained in said capacitor.

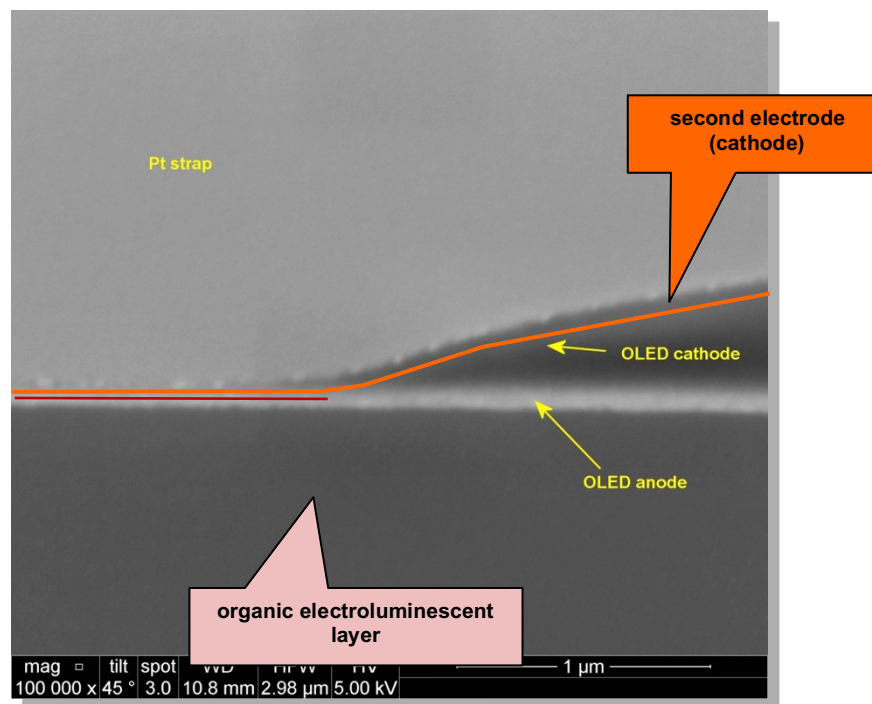
In the '450 Accused Instrumentalities, the display apparatus further comprises a capacitor for retaining the signal corresponding to the image data externally supplied through said selection transistor while said selection transistor is on; and while said selection transistor is off, said drive transistor is driven by the signal retained in said capacitor. For example, in the Samsung Galaxy S8, the display apparatus contains a capacitor (label, for example, below) retaining the signal corresponding to the image data while the selection transistor is on, and while the selection transistor is off, the drive transistor is driven by the signal retained in the capacitor:



*Claim Element**'450 Accused Instrumentalities*

8. The display apparatus according to claim 1, wherein a constant voltage is applied to said second electrode.

The '450 Accused Instrumentalities comprise a display apparatus according to claim 1, wherein a constant voltage is applied to said second electrode. For example, in the Samsung Galaxy S8, a constant voltage is applied to said second electrode:



*Claim Element**'450 Accused Instrumentalities*

12. The display apparatus according to claim 1, wherein: said display apparatus further comprises at least one filter formed above said at least one second electrode; and light rays in a first wavelength range pass through said at least one filter selectively when incident light rays in a second wavelength range including said first wavelength range enter said at least one filter.

In the '450 Accused Instrumentalities, the display apparatus further comprises at least one filter formed above said at least one second electrode; and light rays in a first wavelength range pass through said at least one filter selectively when incident light rays in a second wavelength range including said first wavelength range enter said at least one filter. On information and belief, one or more of the '450 Accused Instrumentalities contain a red, green, and blue color filter positioned above the cathode for each respective sub-pixel, selectively permitting light rays in red, green, and blue wavelength ranges respectively pass through each filter.

13. The display apparatus according to claim 12, wherein said at least one filter has a red filter which makes light in a red wavelength range pass through, a green filter which makes light in a green wavelength range pass through, and a blue filter which makes light in a blue wavelength range pass through.

In the '450 Accused Instrumentalities, the filters include a red filter which makes light in a red wavelength range pass through, a green filter which makes light in a green wavelength range pass through, and a blue filter which makes light in a blue wavelength range pass through. On information and belief, one or more of the '450 Accused Instrumentalities contain a red, green, and blue color filter positioned above the cathode for each respective sub-pixel, selectively permitting light rays in red, green, and blue wavelength ranges respectively pass through each filter.

Claim Element

'450 Accused Instrumentalities

15. A display apparatus comprising:

To the extent the preamble is deemed limiting, the '450 Accused Instrumentalities comprise a display apparatus. For example, the Samsung Galaxy S8 contains an OLED display panel:

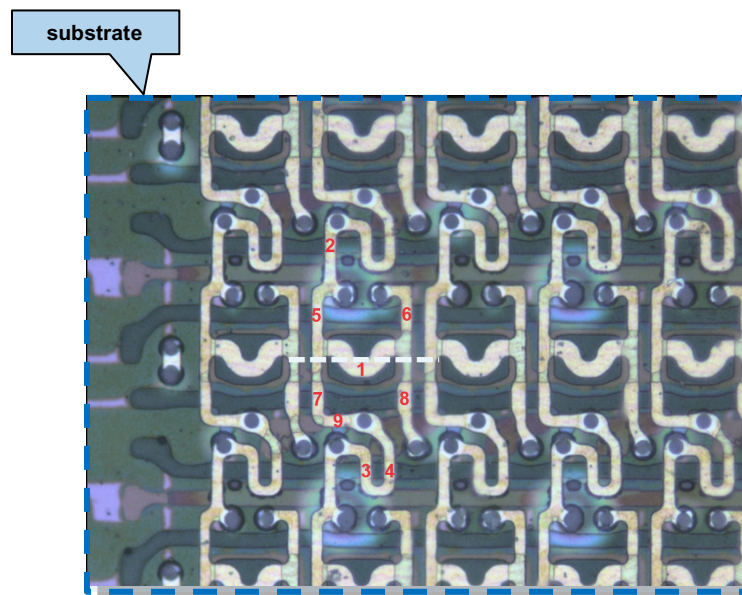


Claim Element

'450 Accused Instrumentalities

[15a] a substrate;

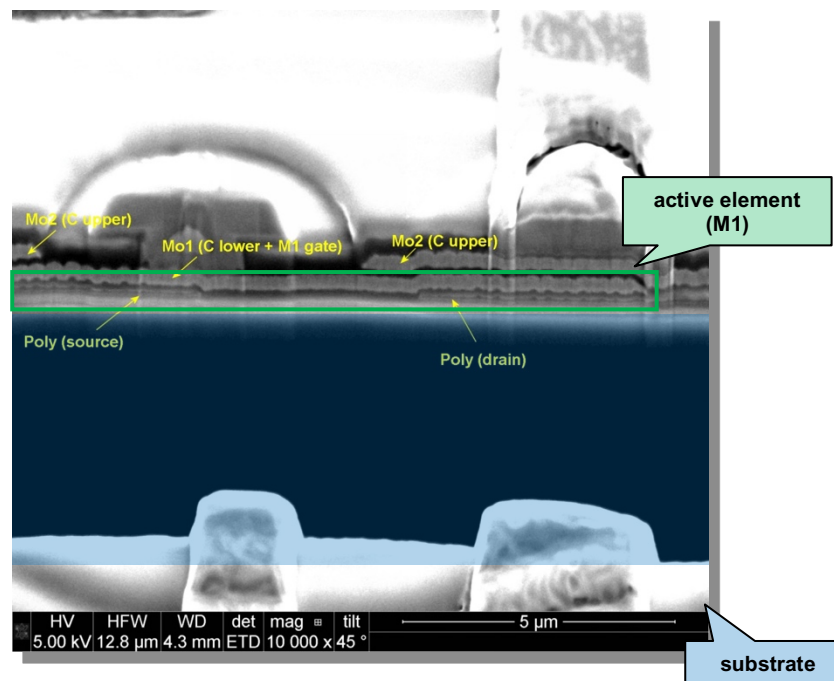
The '450 Accused Instrumentalities comprise a substrate. For example, the Samsung Galaxy S8 contains a polyimide substrate:



*Claim Element**'450 Accused Instrumentalities*

[15b] selection transistors formed over said substrate and arranged in a matrix pattern;

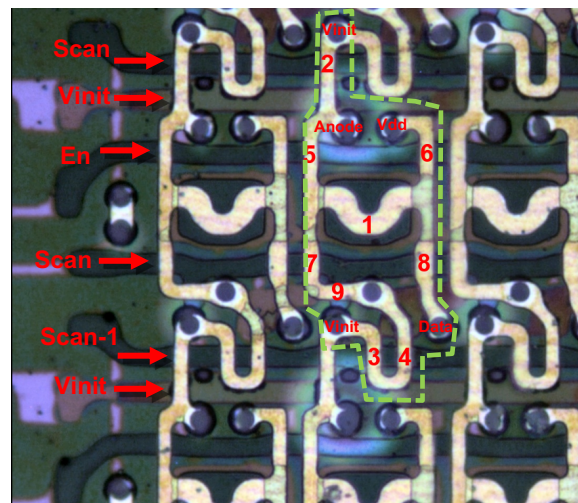
The '450 Accused Instrumentalities comprise selection transistors formed over said substrate and arranged in a matrix pattern. For example, the Samsung Galaxy S8 contains active elements formed over the substrate:



Claim Element

'450 Accused Instrumentalities

The active elements include selection transistors (see, for example, labels 7 and 9 below):



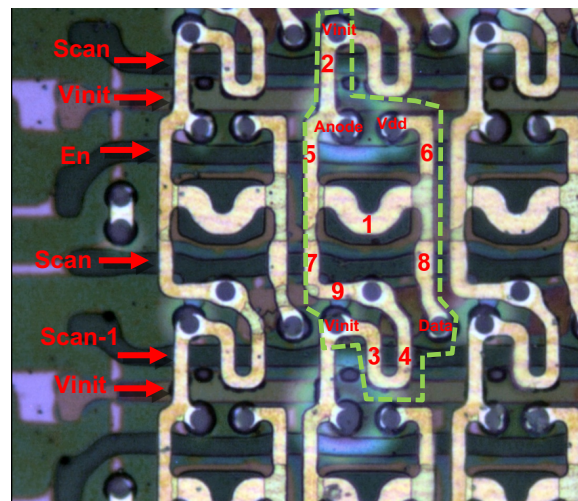
As shown above the selection transistors corresponding to the various pixels are arranged in a matrix pattern.

To the extent that Samsung contends elements labeled 7 and/or 9 in the image above do not literally satisfy the “selection transistors . . . arranged in a matrix pattern” element, that element is present under the doctrine of equivalents.

*Claim Element**'450 Accused Instrumentalities*

[15c] drive transistors formed over said substrate and arranged in a matrix pattern, each of said drive transistors being connected to one of said selection transistors;

The '450 Accused Instrumentalities comprise drive transistors formed over said substrate and arranged in a matrix pattern, each of said drive transistors being connected to one of said selection transistors. For example, in the Samsung Galaxy S8, the active elements include drive transistors (see, for example, label 1 below):

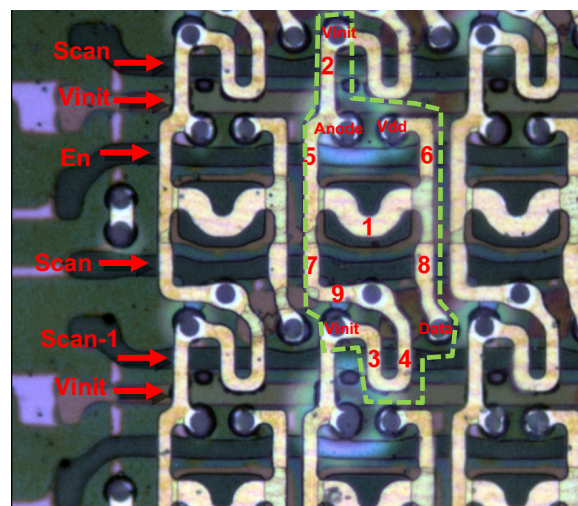


As shown above the drive transistors corresponding to the various pixels are arranged in a matrix pattern. Each drive transistor (see label 1) is connected to a selection transistor (see labels 7 and/or 9).

*Claim Element**'450 Accused Instrumentalities*

[15d] address lines connected to said selection transistors and through which a signal for turning on said selection transistors is supplied;

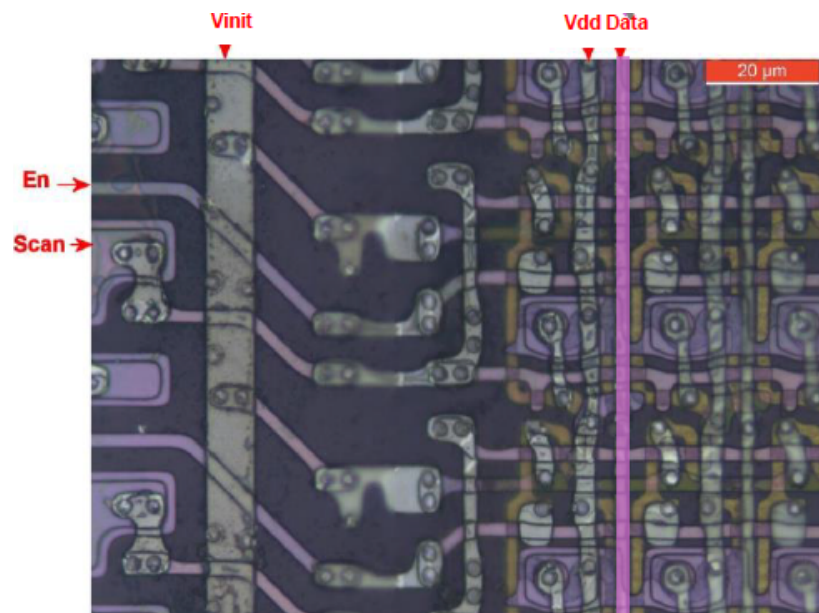
The '450 Accused Instrumentalities comprise address lines connected to said selection transistors and through which a signal for turning on said selection transistors is supplied. For example, in the Samsung Galaxy S8, address lines (see, for example, the “Scan” line below) are connected to the selection transistors and carry a signal for turning on the selection transistors:



*Claim Element**'450 Accused Instrumentalities*

[15e] data lines connected to said selection transistors, a signal which corresponds to image data being supplied to said drive transistors through said data lines and said selection transistors while said selection transistors are on;

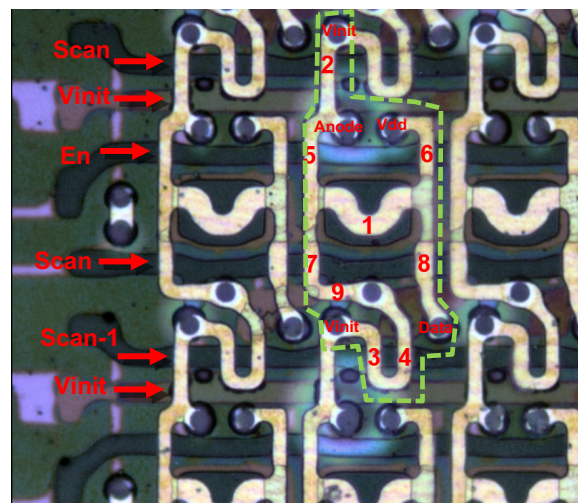
The '450 Accused Instrumentalities comprise data lines connected to said selection transistors, a signal which corresponds to image data being supplied to said drive transistors through said data lines and said selection transistors while said selection transistors are on. For example, the Samsung Galaxy S8 contains data lines such as that labeled "Data" below:



Claim Element

'450 Accused Instrumentalities

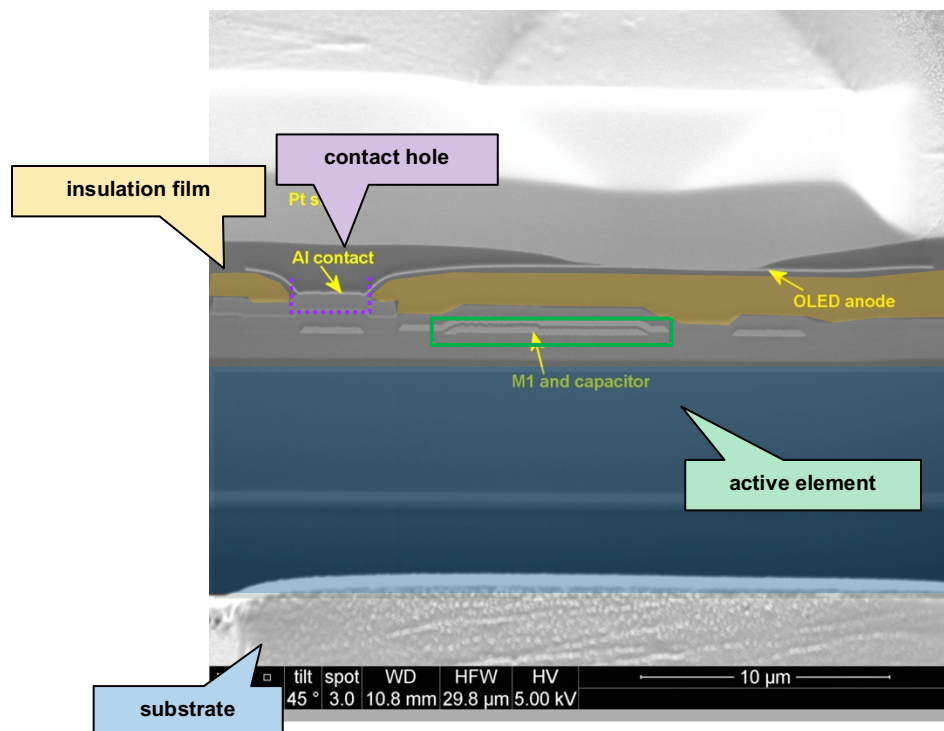
A signal which corresponds to image data is supplied to the drive transistors (see label 1) through the data lines and the selection transistors (see labels 7 and 9) while said selection transistors are on:



*Claim Element**'450 Accused Instrumentalities*

[15f] an insulation film formed over said substrate so as to cover said drive transistors, said address lines and said data lines, said insulation film having contact holes formed in correspondence with said drive transistors;

The '450 Accused Instrumentalities comprise an insulation film formed over said substrate so as to cover said drive transistors, said address lines and said data lines, said insulation film having contact holes formed in correspondence with said drive transistors. For example, in the Samsung Galaxy S8, an insulation film is formed over the substrate, covers the drive transistors, address lines, and data lines, and has contact holes in correspondence with the drive transistors (see label M1):

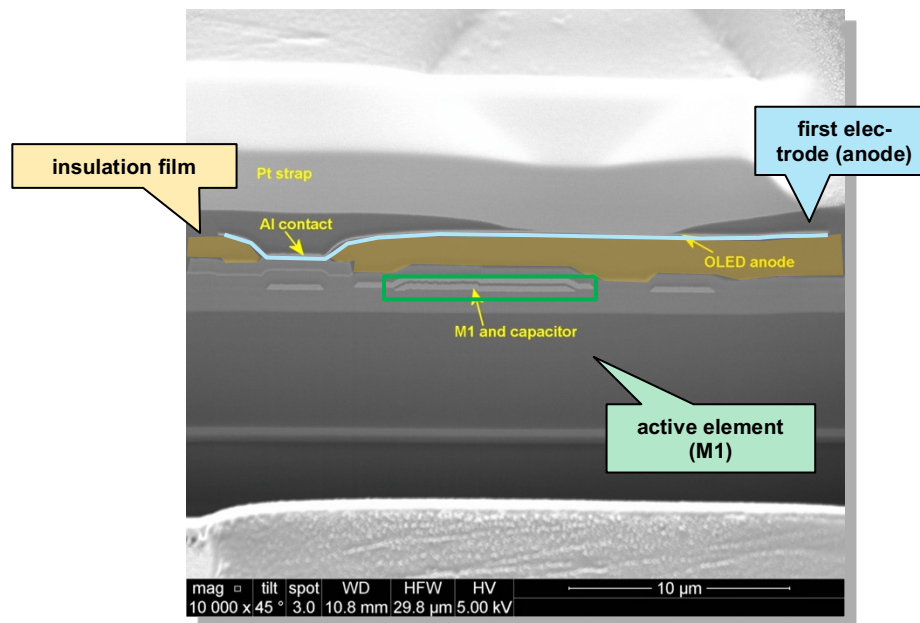


Claim Element

[15g] first electrodes made of a material which shields visible light, and formed on said insulation film so as to cover said selection transistors and said drive transistors, said first electrodes being arranged in a matrix pattern in areas surrounded by said address lines and said data lines, and being connected to said drive transistors through said contact holes;

'450 Accused Instrumentalities

The '450 Accused Instrumentalities comprise first electrodes made of a material which shields visible light, and formed on said insulation film so as to cover said selection transistors and said drive transistors, said first electrodes being arranged in a matrix pattern in areas surrounded by said address lines and said data lines, and being connected to said drive transistors through said contact holes. For example, in the Samsung Galaxy S8, an electrode is formed on the insulation film, covers selection transistors and drive transistors, and is connected to active elements through contact holes:

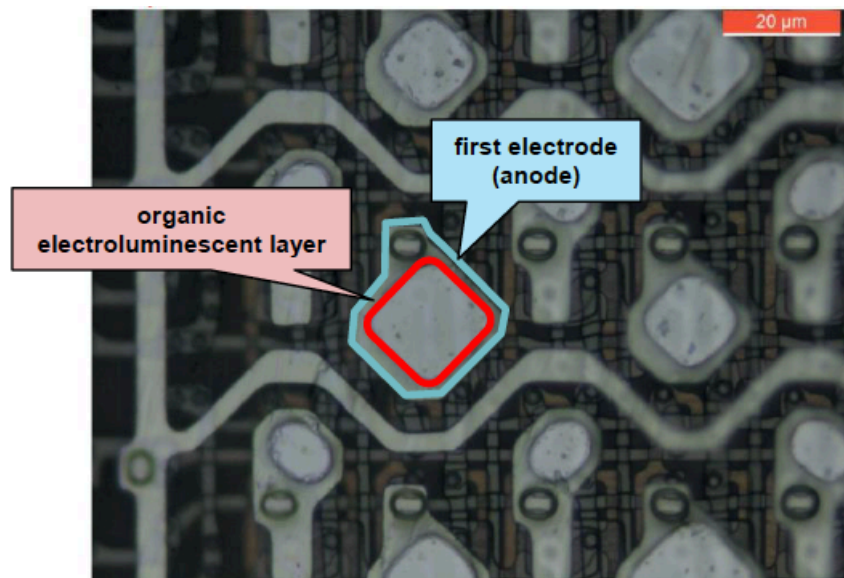


This electrode is formed of silver, which shields visible light.

Claim Element

'450 Accused Instrumentalities

The first electrodes are arranged in a matrix pattern in areas surrounded by the address lines and the data lines:

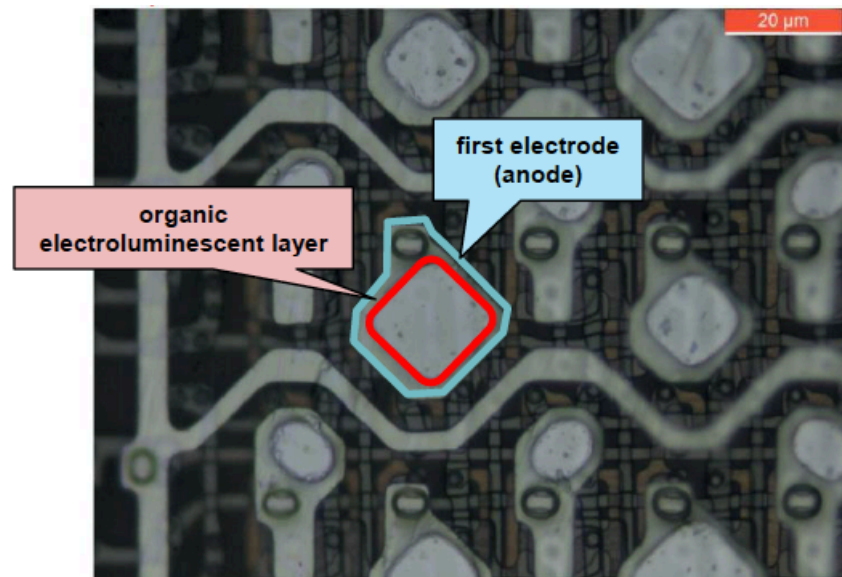


Claim Element

[15h] an organic electroluminescent layer formed on said first electrodes which covers said selection transistors and said drive transistors and including at least one layer which emits light in accordance with an applied voltage;

'450 Accused Instrumentalities

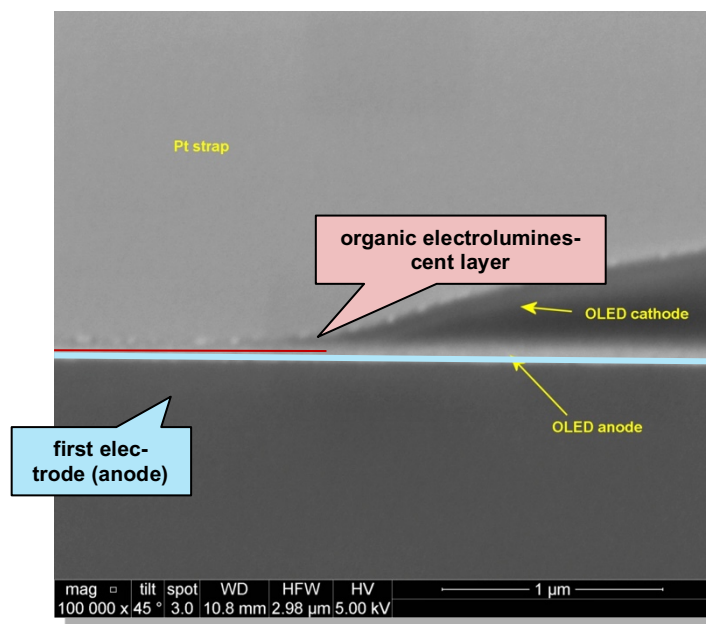
The '450 Accused Instrumentalities comprise an organic electroluminescent layer formed on said first electrodes which covers said selection transistors and said drive transistors and including at least one layer which emits light in accordance with an applied voltage. For example, in the Samsung Galaxy S8, a layer of organic electroluminescent material is formed on the electrode, and covers selection transistors and drive transistors:



Claim Element

'450 Accused Instrumentalities

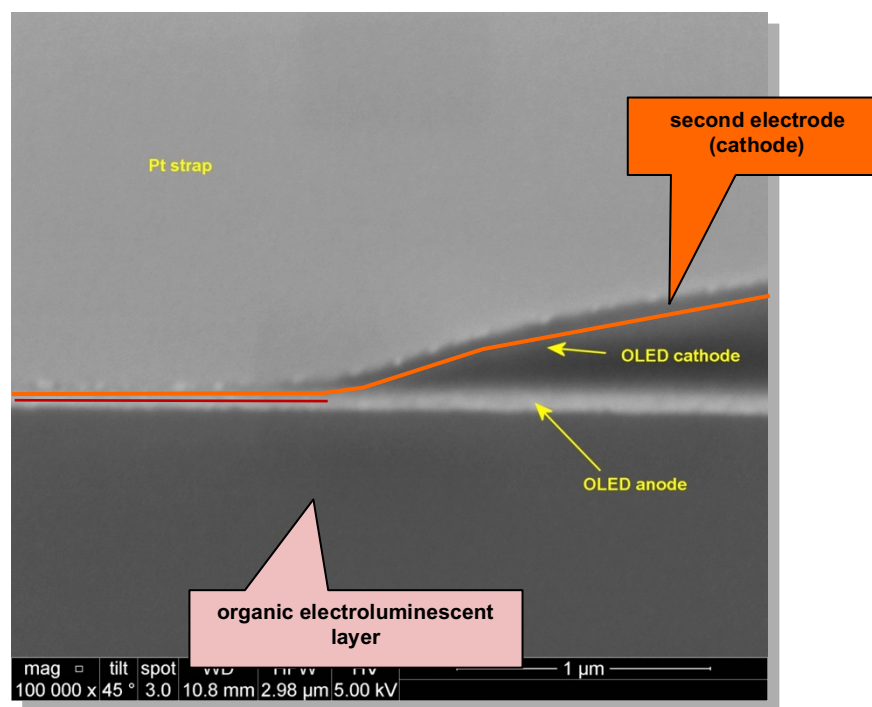
This organic electroluminescent layer emits in accordance with a voltage applied to the layer using the OLED cathode and anode:



*Claim Element**'450 Accused Instrumentalities*

[15i] a second electrode formed on said organic electroluminescent layer which covers said selection transistors and said drive transistors;

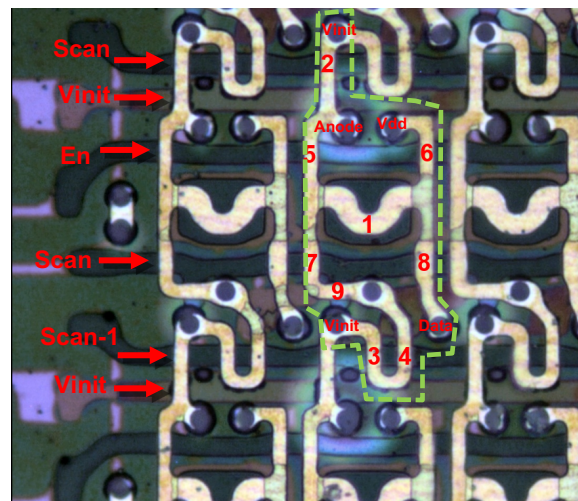
The '450 Accused Instrumentalities comprise a second electrode formed on said organic electroluminescent layer which covers said selection transistors and said drive transistors. For example, in the Samsung Galaxy S8, a second electrode is formed on the organic electroluminescent layer covers selection transistors and drive transistors:



*Claim Element**'450 Accused Instrumentalities*

[15j] a first driver circuit for selectively supplying said address signal to said address lines in sequence; and

The '450 Accused Instrumentalities comprise a first driver circuit for selectively supplying said address signal to said address lines in sequence. For example, in the Samsung Galaxy S8, the selection transistors are turned on in response to externally supplied address signals, such as lines "Scan-1" and "Scan" shown below:

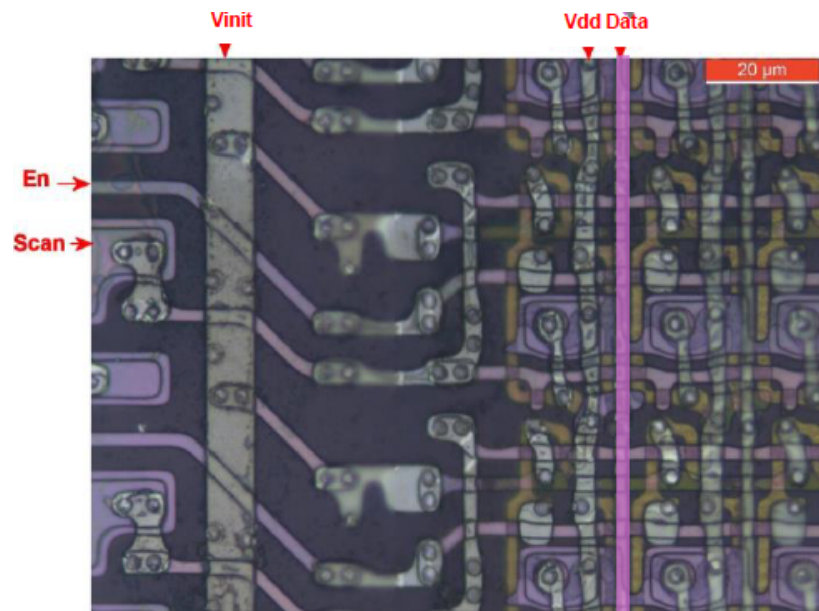


A driver circuit selectively supplies an address signal to these address lines in sequence, e.g., "Scan-1" followed by "Scan."

*Claim Element**'450 Accused Instrumentalities*

[15k] a second driver circuit for supplying said image data to said data lines.

The '450 Accused Instrumentalities comprise a second driver circuit for supplying said image data to said data lines. For example, the Samsung Galaxy S8 contains data lines such as that labeled "Data" below:



A driver circuit drives the data lines with electrical signals containing the image data.

*Claim Element**'450 Accused Instrumentalities*

16. The display apparatus according to claim 15, wherein a constant voltage is applied to said second electrode.

The '450 Accused Instrumentalities comprise a display apparatus according to claim 15, wherein a constant voltage is applied to said second electrode. For example, in the Samsung Galaxy S8 a constant voltage is applied to said second electrode:

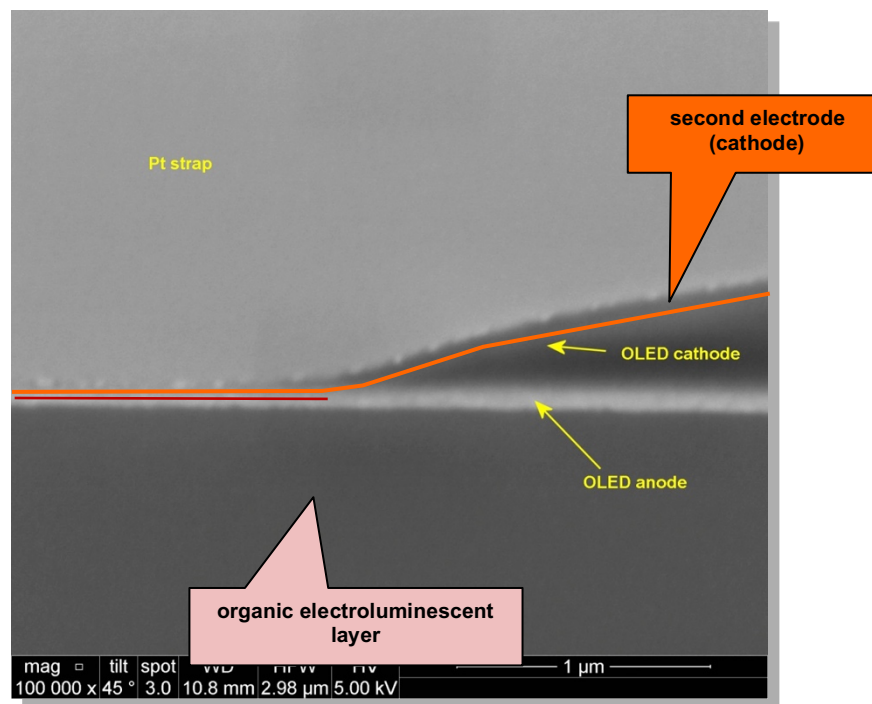


EXHIBIT B

EXHIBIT B: P.R. 3-1(C) CHART FOR U.S. PATENT NO. 7,446,338

Plaintiff Solas OLED Ltd. (Solas) provides this chart based upon information that is presently available to it. Solas has not had access to Samsung’s confidential design documents or to other materials that may become available during discovery. Solas reserves the right to change or provide more detail to the infringement theories set forth below, based upon information that it learns during this case, subject to the Court’s rules and orders.

Definitions:

The term ’338 Accused Instrumentalities is defined in Section I.B.2 of Plaintiff Solas OLED Limited’s Disclosure of Asserted Claims and Infringement Contentions.

<i>Claim Element</i>	<i>’338 Accused Instrumentalities</i>
1. A display panel comprising:	To the extent the preamble is deemed limiting, the ’338 Accused Instrumentalities comprise a display panel. For example, the Samsung Galaxy S8 contains an OLED display panel:

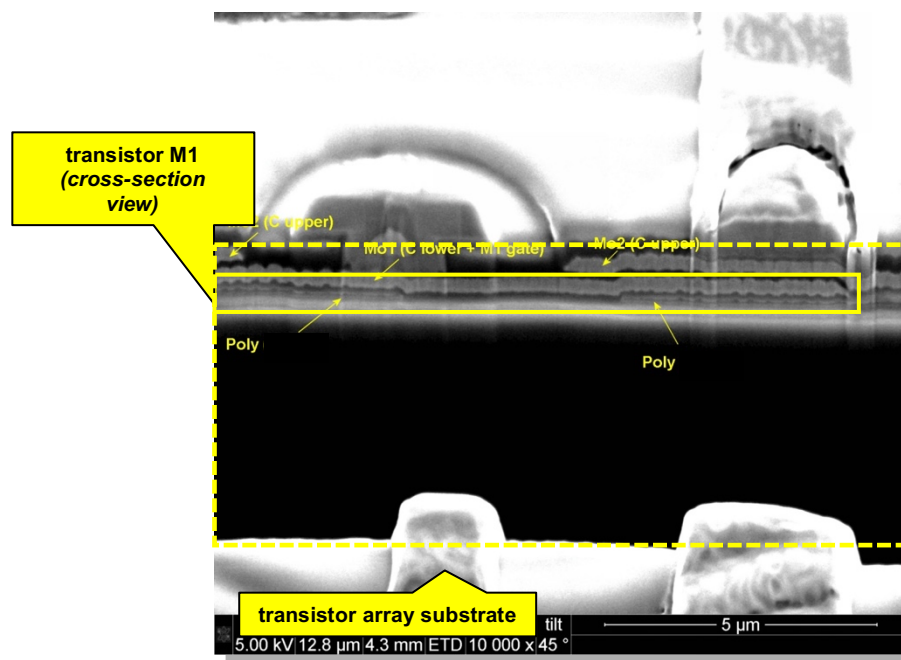


Claim Element

[1a] a transistor array substrate which includes a plurality of pixels and comprises a plurality of transistors for each pixel, each of the transistors including a gate, a gate insulating film, a source, and a drain;

'338 Accused Instrumentalities

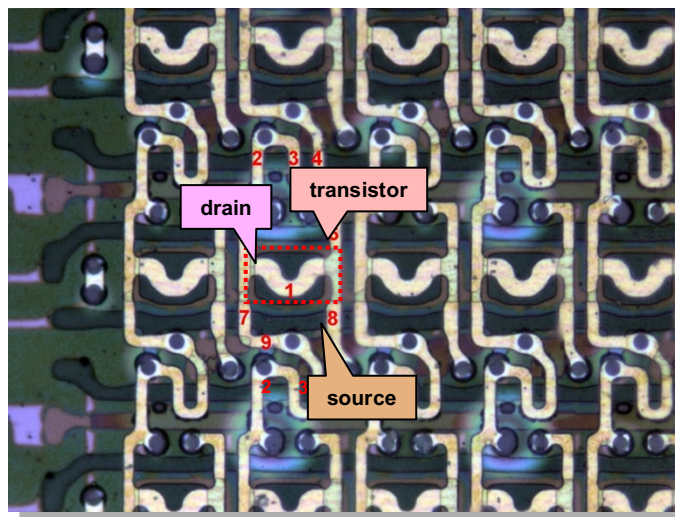
The '338 Accused Instrumentalities comprise a transistor array substrate which includes a plurality of pixels and comprises a plurality of transistors for each pixel, each of the transistors including a gate, a gate insulating film, a source, and a drain. For example, the Samsung Galaxy S8 contains a transistor array substrate:



Claim Element

'338 Accused Instrumentalities

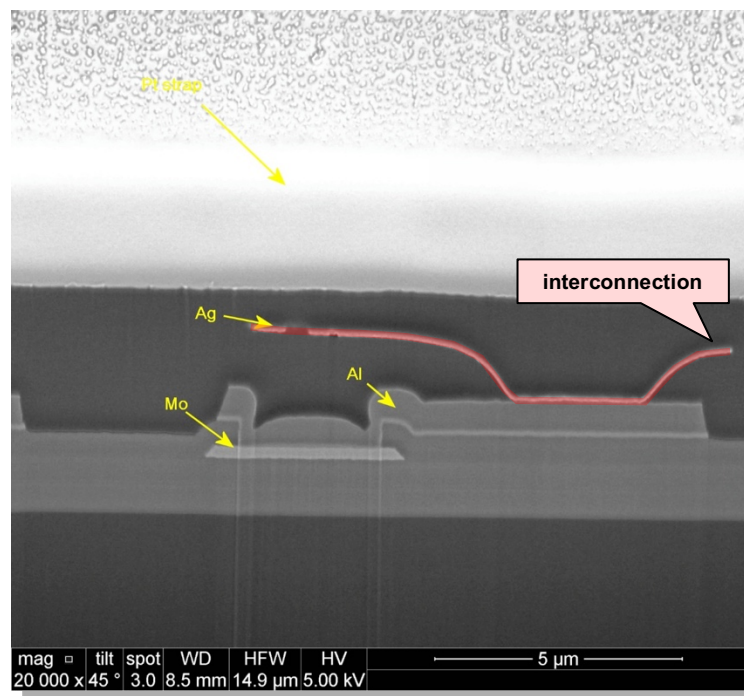
The transistor array substrate includes a plurality of pixels and comprises a plurality of transistors for each pixel, each of the transistors including a gate, a gate insulating film, a source, and a drain:



*Claim Element**'338 Accused Instrumentalities*

[1b] a plurality of interconnections which are formed to project from a surface of the transistor array substrate, and which are arrayed in parallel to each other;

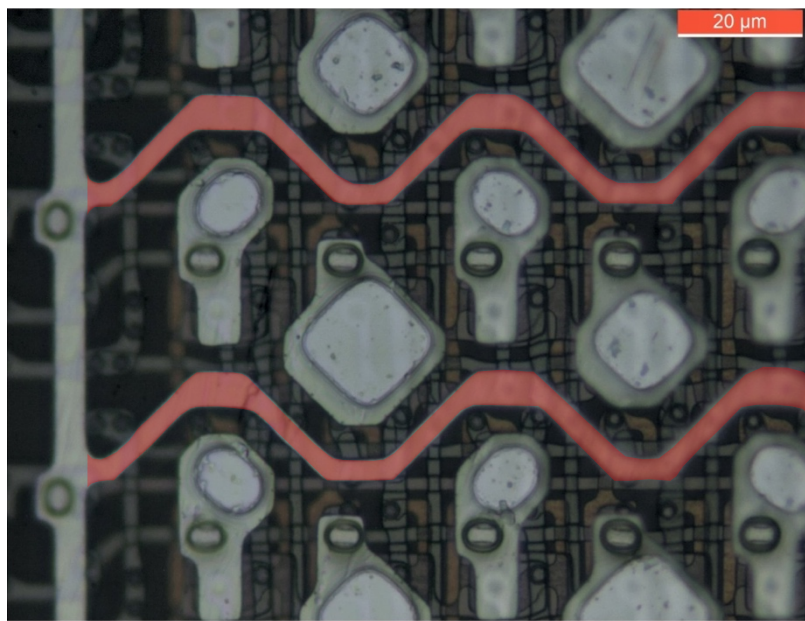
The '338 Accused Instrumentalities comprise a plurality of interconnections which are formed to project from a surface of the transistor array substrate, and which are arrayed in parallel to each other. For example, the Samsung Galaxy S8 contains a plurality of interconnections which are formed to project from a surface of the transistor array substrate:



Claim Element

'338 Accused Instrumentalities

These interconnections are arrayed in parallel to each other:



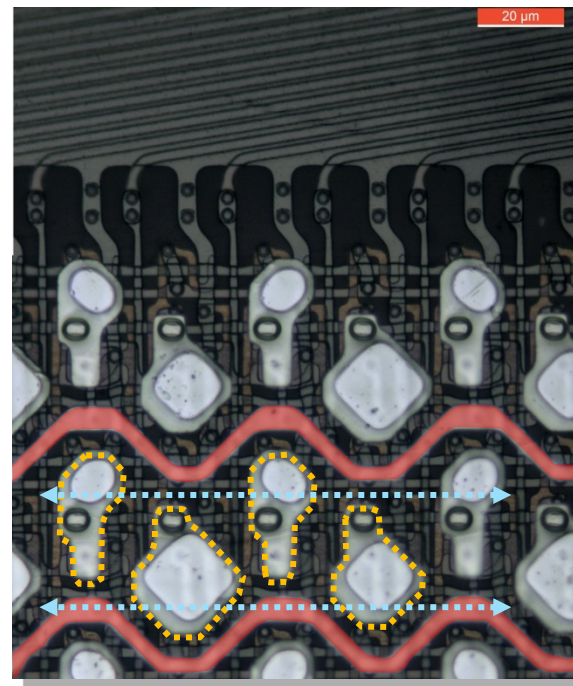
To the extent that Samsung contends that the limitation “arrayed in parallel to each other” is not literally present, this limitation is present under the doctrine of equivalents.

Claim Element

[1c] a plurality of pixel electrodes for the plurality of pixels, respectively, the pixel electrodes being arrayed along the interconnections between the interconnections on the surface of the transistor array substrate;

'338 Accused Instrumentalities

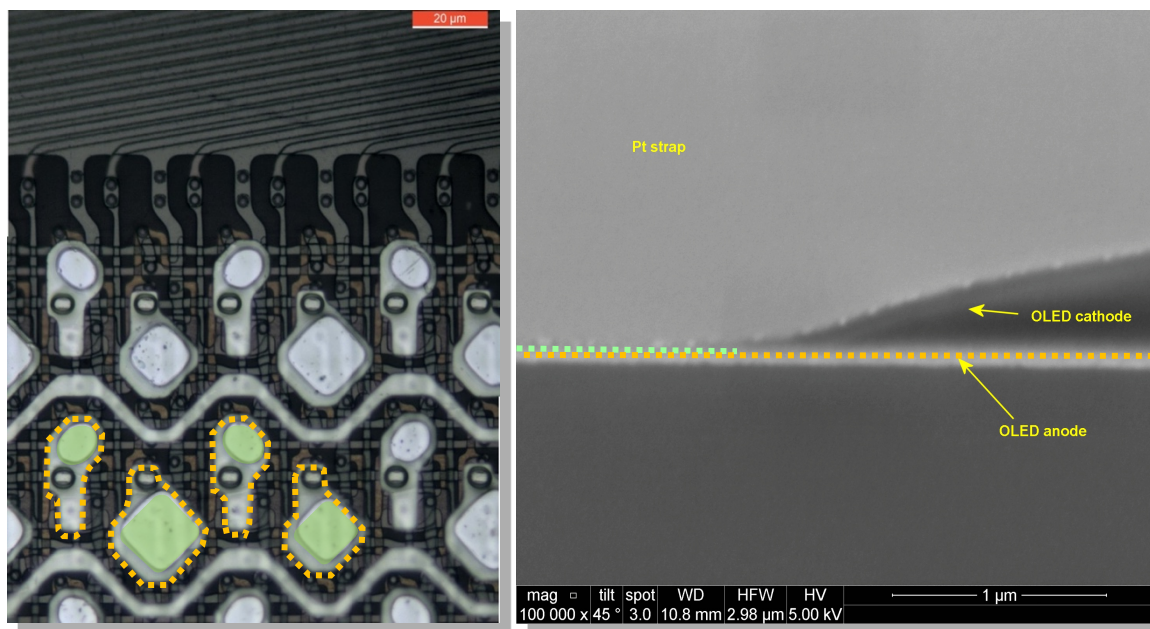
The '338 Accused Instrumentalities comprise a plurality of pixel electrodes for the plurality of pixels, respectively, the pixel electrodes being arrayed along the interconnections between the interconnections on the surface of the transistor array substrate. For example, the Samsung Galaxy S8 contains a plurality of pixel electrodes (in dashed yellow outlines below) for the plurality of pixels, respectively, the pixel electrodes being arrayed along the interconnections between the interconnections on the surface of the transistor array substrate:



*Claim Element**'338 Accused Instrumentalities*

[1d] a plurality of light-emitting layers formed on the pixel electrodes, respectively; and

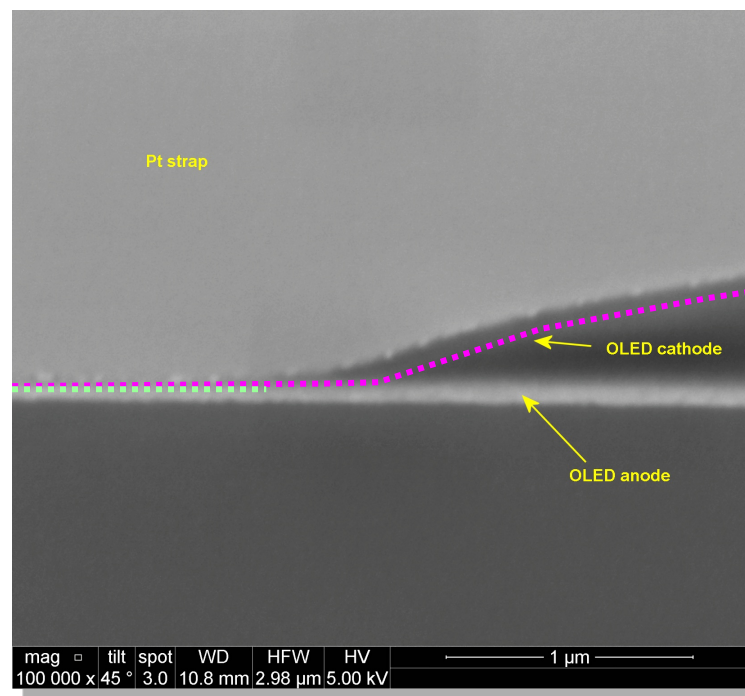
The '338 Accused Instrumentalities comprise a plurality of light-emitting layers formed on the pixel electrodes, respectively. For example, the Samsung Galaxy S8 contains a plurality of light-emitting layers (highlighted in green below) formed on the pixel electrodes ("OLED anode" below), respectively:



*Claim Element**'338 Accused Instrumentalities*

[1e] a counter electrode which is stacked on the light-emitting layers,

The '338 Accused Instrumentalities comprise a counter electrode which is stacked on the light-emitting layers. For example, the Samsung Galaxy S8 contains a counter electrode ("OLED cathode" below) which is stacked on the light-emitting layers:

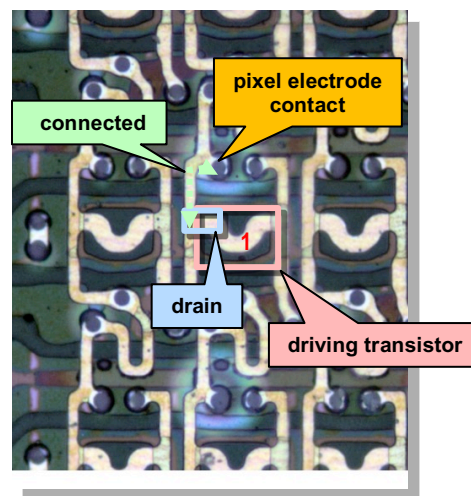


Claim Element

[1f] wherein said plurality of transistors for each pixel include a driving transistor, one of the source and the drain of which is connected to the pixel electrode, a switch transistor which makes a write current flow between the drain and the source of the driving transistor, and a holding transistor which holds a voltage between the gate and source of the driving transistor in a light emission period.

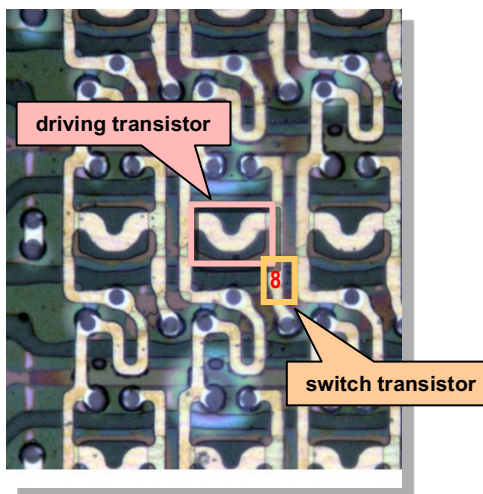
'338 Accused Instrumentalities

In the '338 Accused Instrumentalities, the plurality of transistors for each pixel include a driving transistor, one of the source and the drain of which is connected to the pixel electrode, a switch transistor which makes a write current flow between the drain and the source of the driving transistor, and a holding transistor which holds a voltage between the gate and source of the driving transistor in a light emission period. For example, in the Samsung Galaxy S8, the plurality of transistors for each pixel includes a driving transistor, the drain of which is connected to the pixel electrode:



Solas OLED Ltd. v. Samsung Display Co., Ltd., et al., Case No. 2:19-cv-00152-JRG

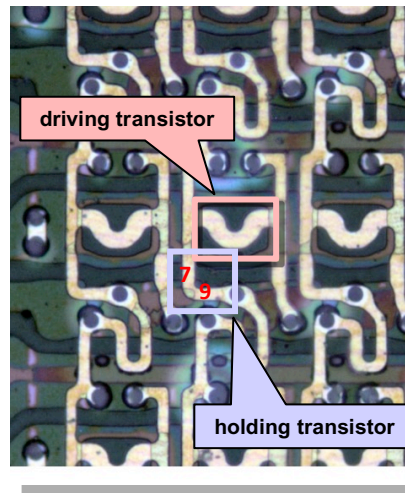
The plurality of transistors includes a switch transistor which makes a write current flow between the drain and the source of the driving transistor:



Claim Element

'338 Accused Instrumentalities

The plurality of transistors includes a holding transistor which holds a voltage between the gate and source of the driving transistor in a light emission period:

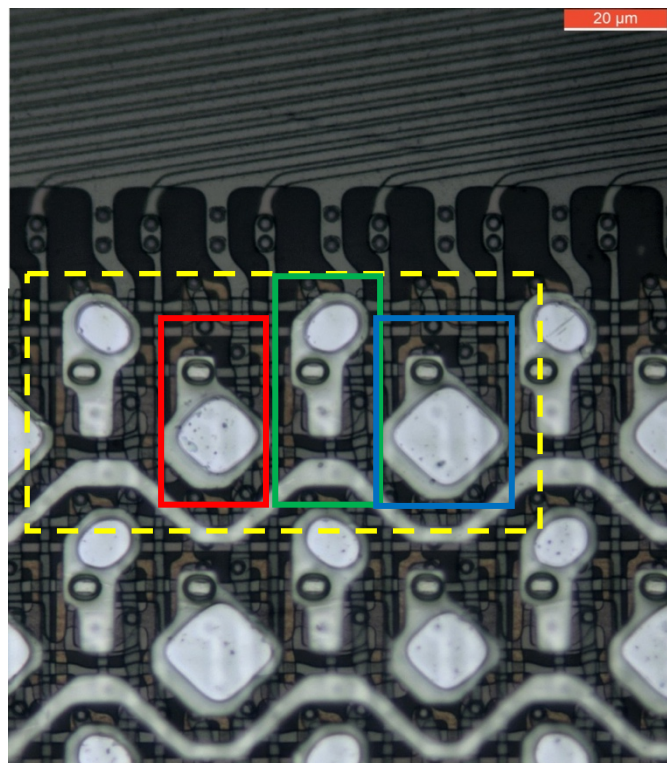


Claim Element

'338 Accused Instrumentalities

5. A panel according to claim 1, wherein said plurality of pixels include a red pixel, a green pixel, and a blue pixel.

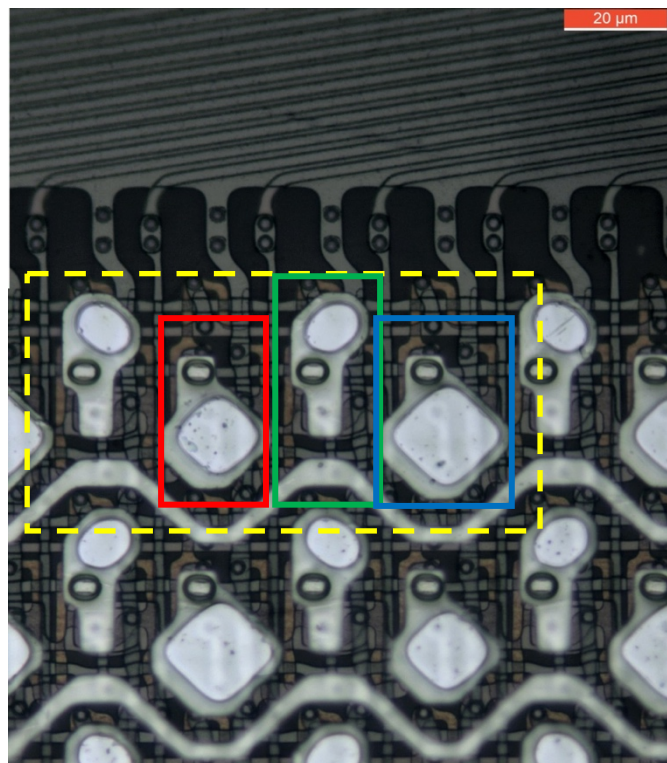
The '338 Accused Instrumentalities comprise a plurality of pixels that includes a red pixel, a green pixel, and a blue pixel. For example, the Samsung Galaxy S8 contains red, green, and blue pixels, labelled by boxes with corresponding colors in the image below:



*Claim Element**'338 Accused Instrumentalities*

6. A panel according to claim 5, wherein said plurality of pixels comprises a plurality of sets each including the red pixel, the green pixel, and the blue pixel arrayed in an arbitrary order.

In the '338 Accused Instrumentalities, plurality of pixels comprises a plurality of sets each including the red pixel, the green pixel, and the blue pixel arrayed in an arbitrary order. For example, the Samsung Galaxy S8 contains red, green, and blue pixels, labelled by boxes with corresponding colors in the image below:



The pixels within the yellow dashed line are an example of one of the plurality of sets of pixels, and the order of pixels in each set is arbitrary.

Claim Element

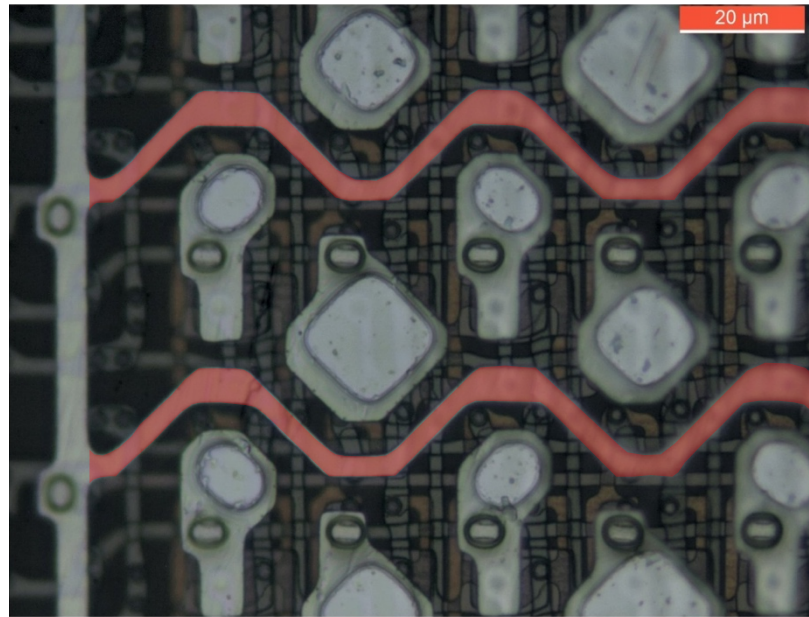
'338 Accused Instrumentalities

9. A panel according to claim 1, wherein at least one of the interconnections has a resistivity of 2.1 to 9.6 $\mu\Omega\text{cm}$.

On information and belief, at least one of the interconnections in each of the '338 Accused Instrumentalities has a resistivity of 2.1 to 9.6 $\mu\Omega\text{cm}$.

10. A panel according to claim 1, wherein said plurality of interconnections are formed from a conductive layer that is different from a layer forming the source and the drain of each of the transistors and a layer forming the gate of the transistors.

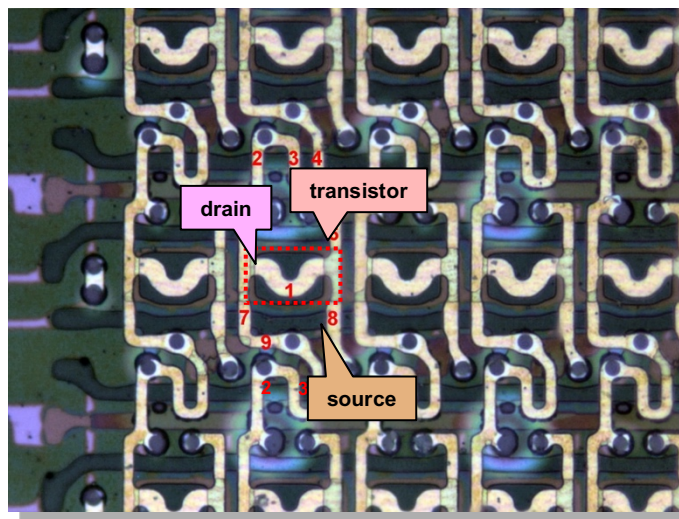
In the '338 Accused Instrumentalities, said plurality of interconnections are formed from a conductive layer that is different from a layer forming the source and the drain of each of the transistors and a layer forming the gate of the transistors. For example, the Samsung Galaxy S8 contains interconnections formed from a conductive layer:



Claim Element

'338 Accused Instrumentalities

The source and drain of each of the transistors is formed in a different layer:



Claim Element

'338 Accused Instrumentalities

The gates of the transistors are also formed in a different layer:

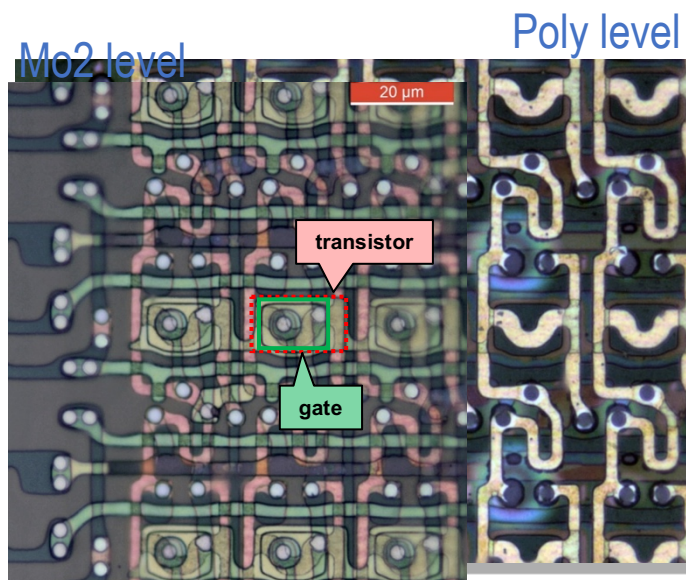


EXHIBIT C

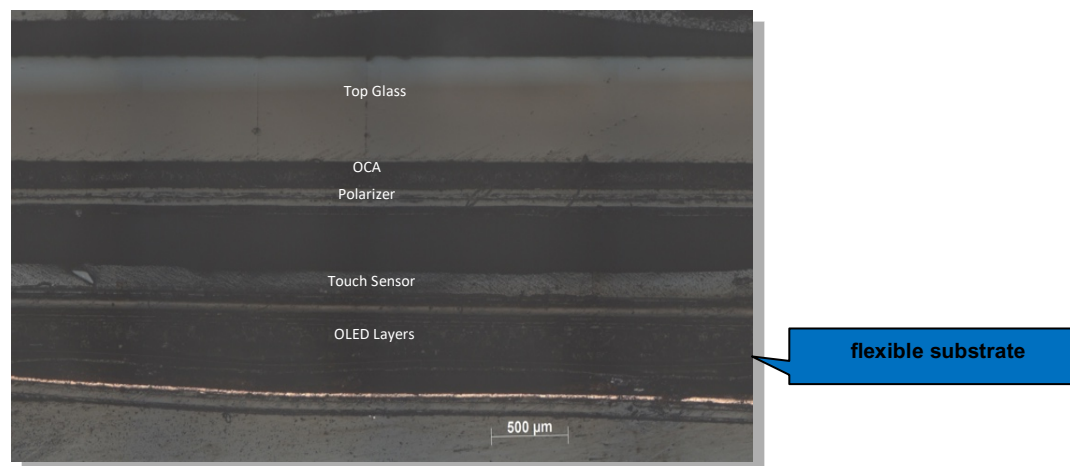
EXHIBIT C: P.R. 3-1(C) CHART FOR U.S. PATENT NO. 9,256,311

Plaintiff Solas OLED Ltd. (Solas) provides this chart based upon information that is presently available to it. Solas has not had access to Samsung's confidential design documents or to other materials that may become available during discovery. Solas reserves the right to change or provide more detail to the infringement theories set forth below, based upon information that it learns during this case, subject to the Court's rules and orders.

Definitions:

The term '311 Accused Instrumentalities is defined in Section I.B.3 of Plaintiff Solas OLED Limited's Disclosure of Asserted Claims and Infringement Contentions.

<i>Claim Element</i>	<i>'311 Accused Instrumentalities</i>
1. An apparatus comprising:	To the extent the preamble is deemed limiting, the '311 Accused Instrumentalities are or contain an apparatus comprising the elements of claim 1, for example as set forth below.
[1a] a substantially flexible substrate; and	The '311 Accused Instrumentalities comprise a substantially flexible substrate. For example, the Samsung Galaxy S9 contains a flexible Organic Light Emitting Diode (OLED) panel that includes a substantially flexible substrate:

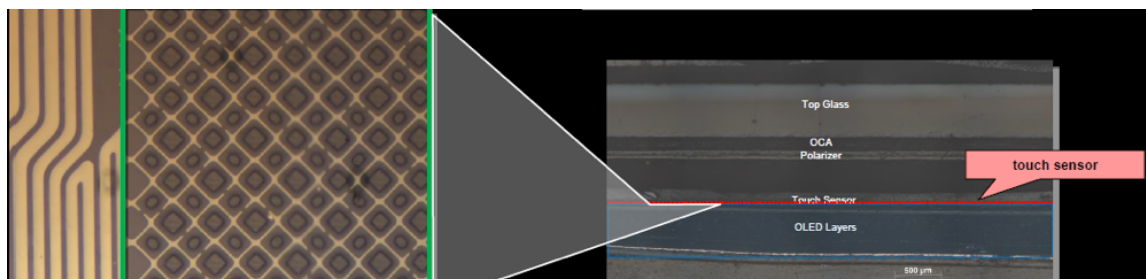


Claim Element

[1b] a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate,

'311 Accused Instrumentalities

The '311 Accused Instrumentalities comprise a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate. For example, the Samsung Galaxy S9 contains a touch sensor layered on top of the flexible OLED panel. The touch sensor includes drive or sense electrodes (the mesh grid illustrated below) made from flexible, conductive metal, configured to bend with the flexible OLED panel:

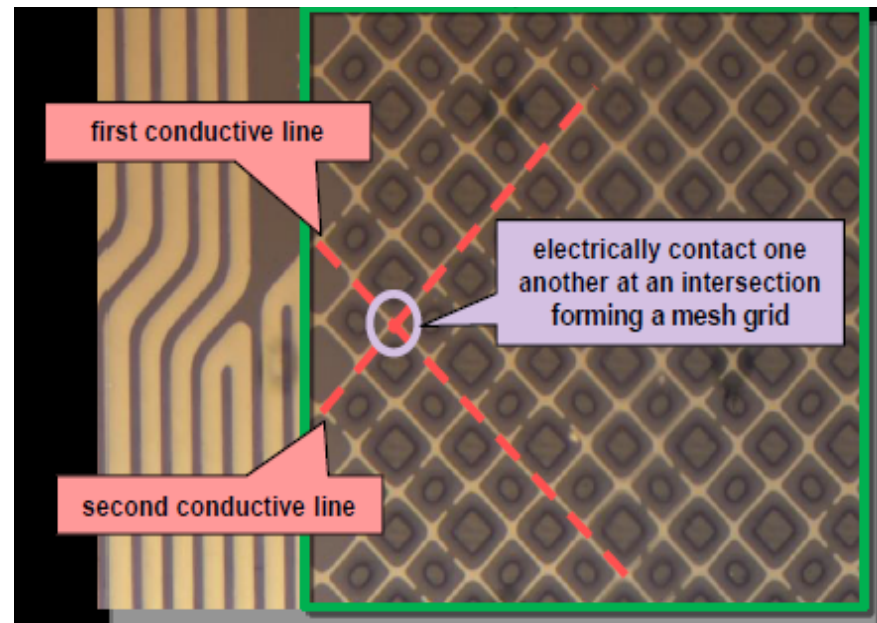


Claim Element

'311 Accused Instrumentalities

[1c] wherein: the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid; and

In the '311 Accused Instrumentalities, the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid. For example, in the Samsung Galaxy S9 the drive or sense electrodes are made from flexible metal mesh. This flexible metal mesh includes conductive metal lines that physically intersect (and thus electrically contact) to form a mesh grid:

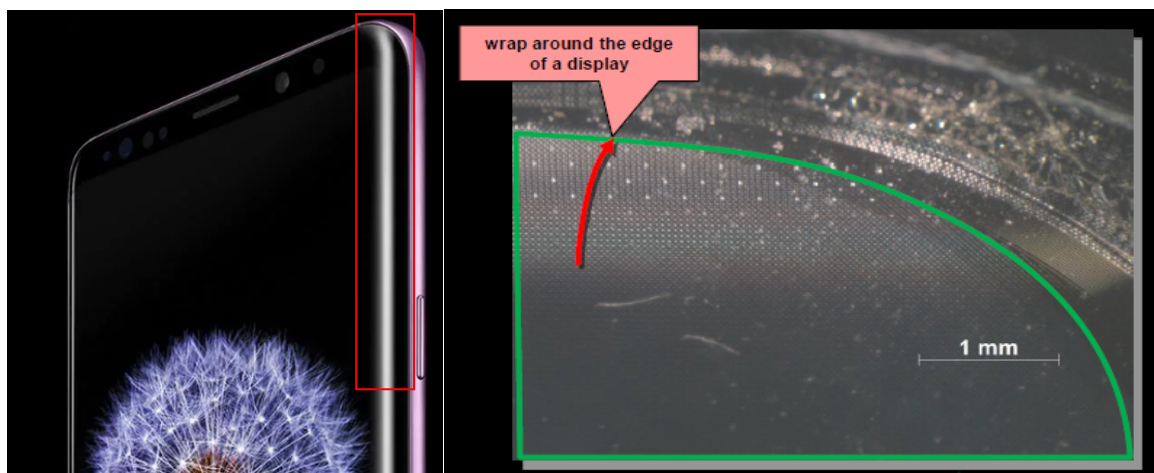


Claim Element

'311 Accused Instrumentalities

[1d] the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display.

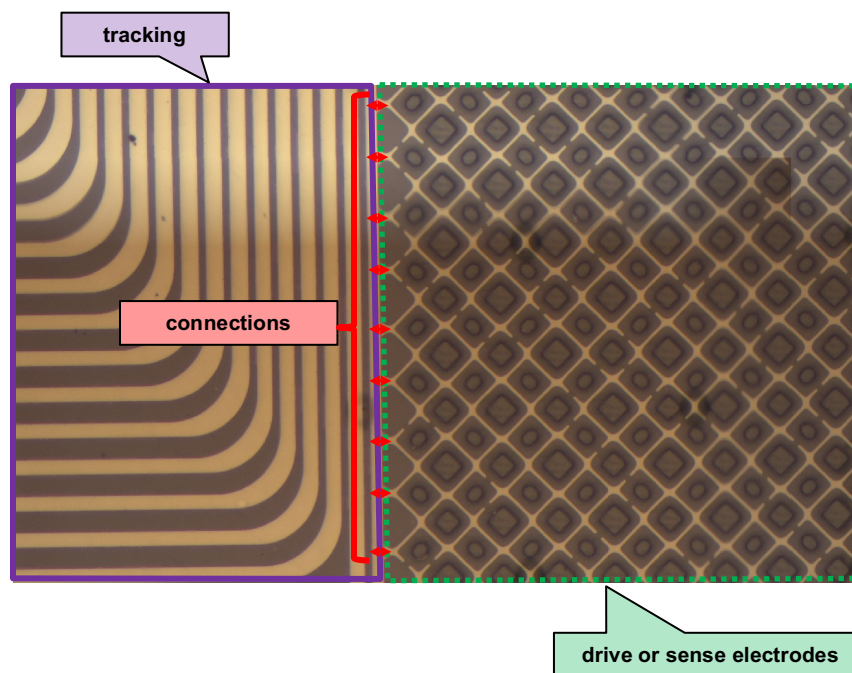
In the '311 Accused Instrumentalities, the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display. For example, in the Samsung Galaxy S9 the flexible metal touch sensor layer and the flexible OLED panel substrate wrap around the edge of the phone display:



*Claim Element**'311 Accused Instrumentalities*

2. The apparatus of claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

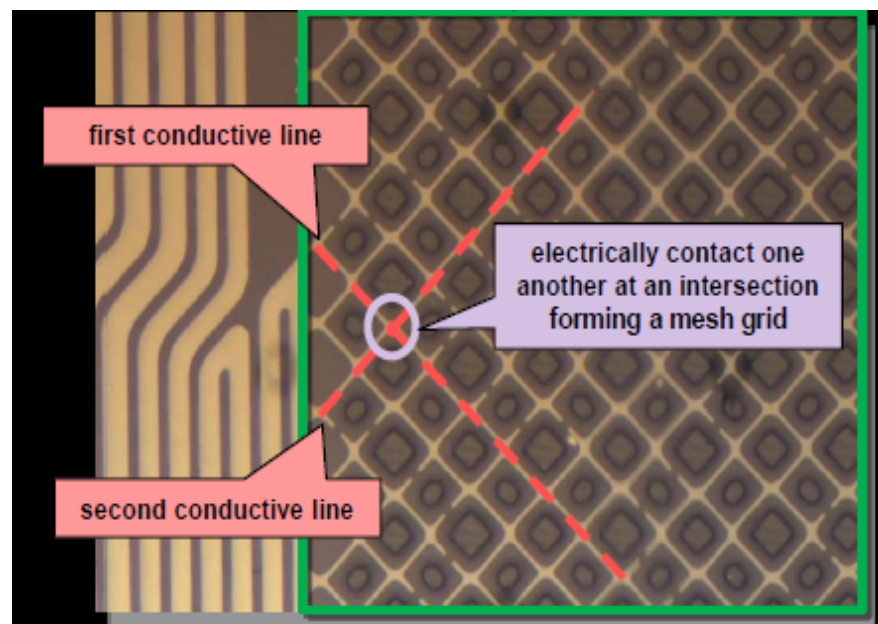
In the '311 Accused Instrumentalities, the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate. For example, the Samsung Galaxy S9 contains tracking disposed on the substantially flexible substrate, which provides drive or sense connections to or from the drive or sense electrodes:



*Claim Element**'311 Accused Instrumentalities*

4. The apparatus of claim 1, wherein the touch sensor comprises:
 a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or
 a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

In the '311 Accused Instrumentalities, the touch sensor comprises a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface. For example, the Samsung Galaxy S9 comprises a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate:

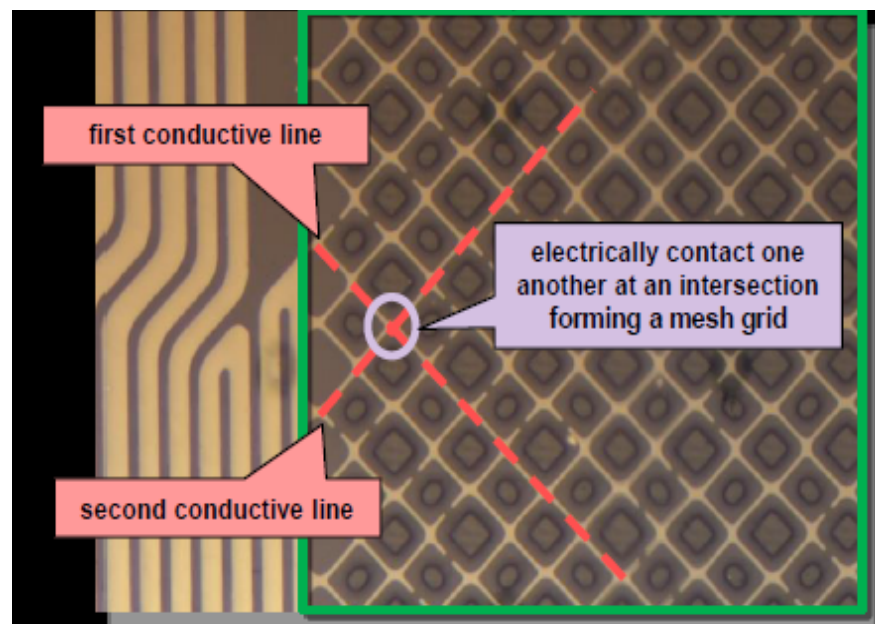


Claim Element

'311 Accused Instrumentalities

5. The apparatus of claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

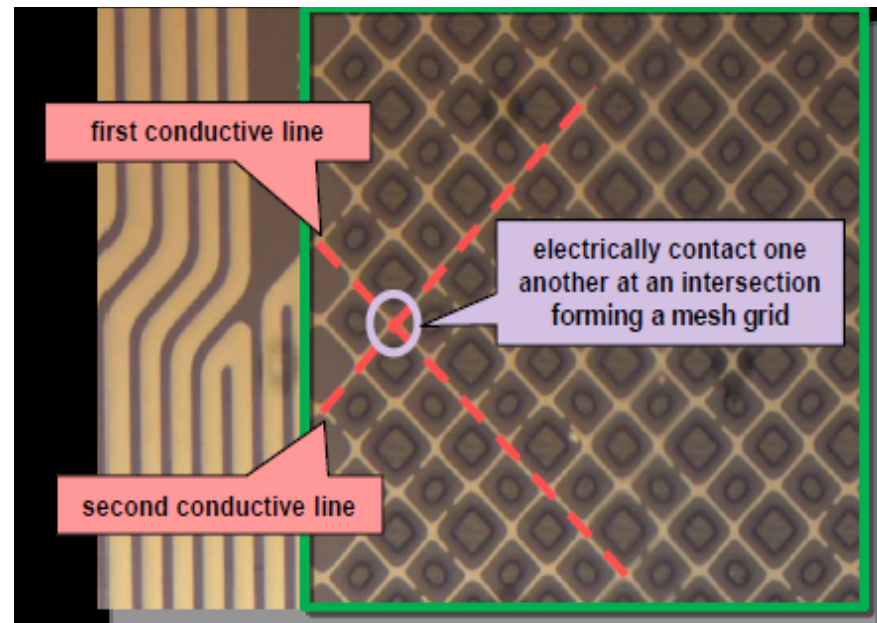
In the '311 Accused Instrumentalities, the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor. For example, the Samsung Galaxy S9 comprises a mutual-capacitance touch sensor:



*Claim Element**'311 Accused Instrumentalities*

6. The apparatus of claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

In the '311 Accused Instrumentalities, the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh. For example, in the Samsung Galaxy S9 the drive or sense electrodes are made from flexible metal mesh. This flexible metal mesh includes electrically-isolated conductive metal lines that physically intersect (and thus electrically contact) to form a mesh grid:



7. A device comprising:

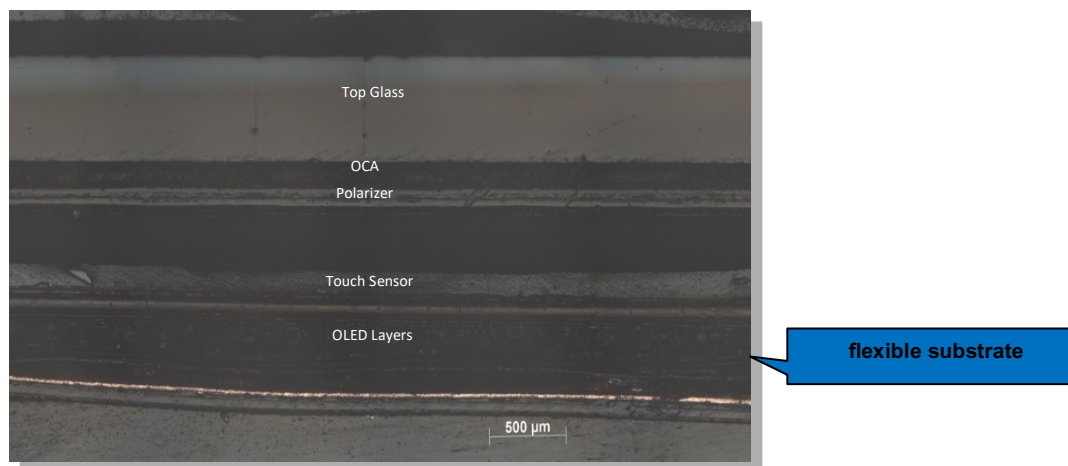
To the extent the preamble is deemed limiting, the '311 Accused Instrumentalities are or contain a device comprising the elements of claim 1, for example as set forth below.

Claim Element

'311 Accused Instrumentalities

[7a] a substantially flexible substrate;

The '311 Accused Instrumentalities comprise a substantially flexible substrate. For example, the Samsung Galaxy S9 contains a flexible Organic Light Emitting Diode (OLED) panel that includes a substantially flexible substrate:

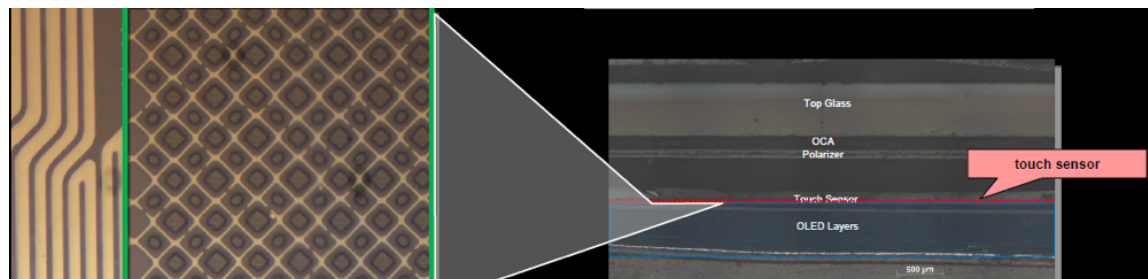


Claim Element

[7b] a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate,

'311 Accused Instrumentalities

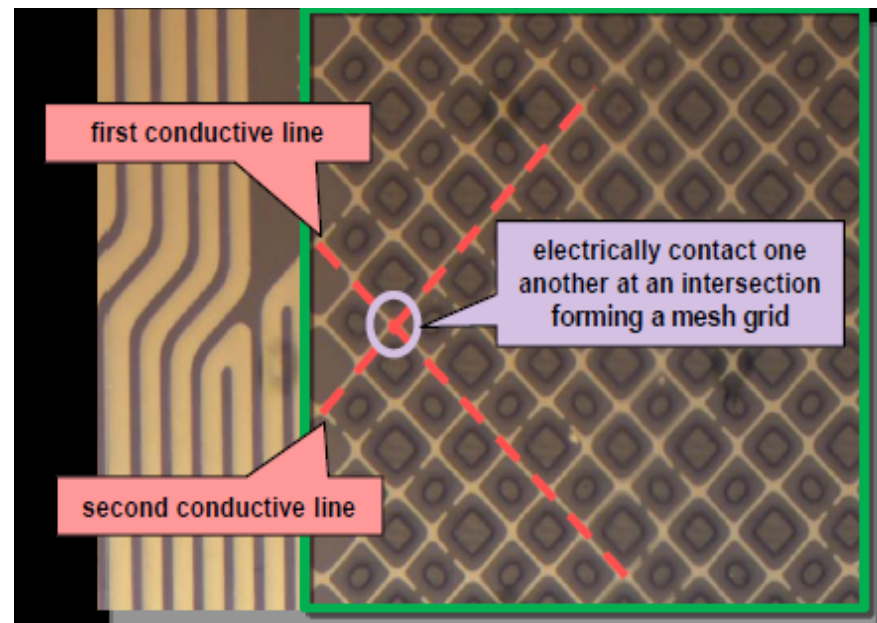
The '311 Accused Instrumentalities comprise a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate. For example, the Samsung Galaxy S9 contains a touch sensor layered on top of the flexible OLED panel. The touch sensor includes drive or sense electrodes (the mesh grid illustrated below) made from flexible, conductive metal, configured to bend with the flexible OLED panel:



*Claim Element**'311 Accused Instrumentalities*

[7c] wherein: the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid;

In the '311 Accused Instrumentalities, the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid. For example, in the Samsung Galaxy S9 the drive or sense electrodes are made from flexible metal mesh. This flexible metal mesh includes conductive metal lines that physically intersect (and thus electrically contact) to form a mesh grid:

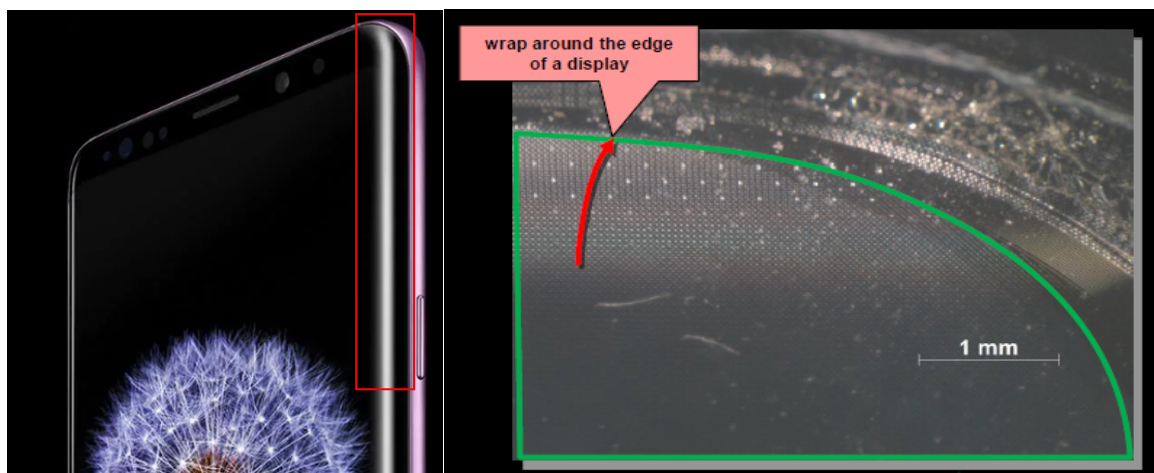


Claim Element

'311 Accused Instrumentalities

[7d] the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display; and

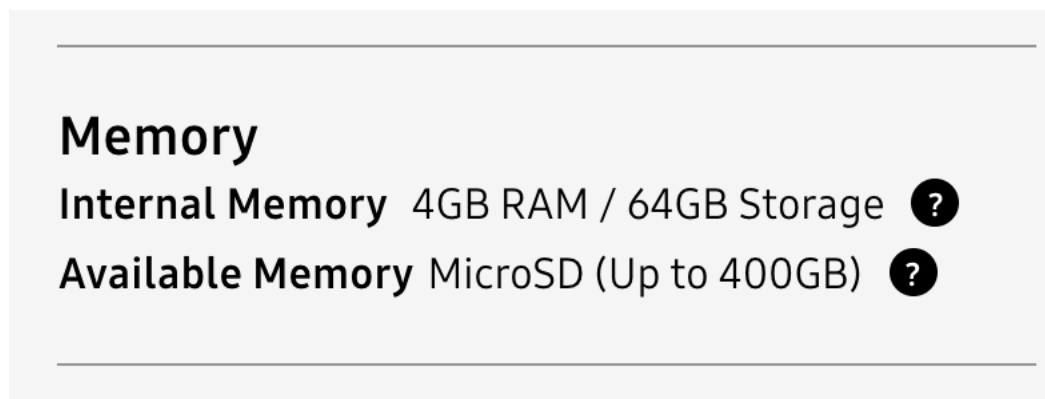
In the '311 Accused Instrumentalities, the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display. For example, in the Samsung Galaxy S9 the flexible metal touch sensor layer and the flexible OLED panel substrate wrap around the edge of the phone display:



*Claim Element**'311 Accused Instrumentalities*

[7e] one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

The '311 Accused Instrumentalities comprise one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor. For example, the Samsung Galaxy S9 contains internal flash storage:

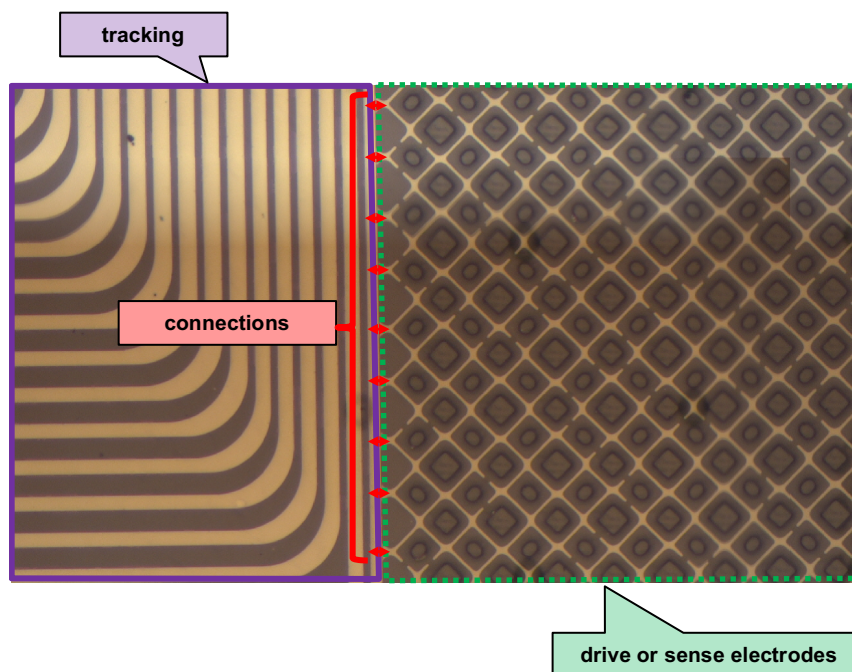


On information and belief, logic that is configured when executed to control the touch sensor is stored in the '311 Accused Instrumentalities on one or more computer-readable non-transitory storage media, such as this internal flash storage.

*Claim Element**'311 Accused Instrumentalities*

8. The device of claim 7, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

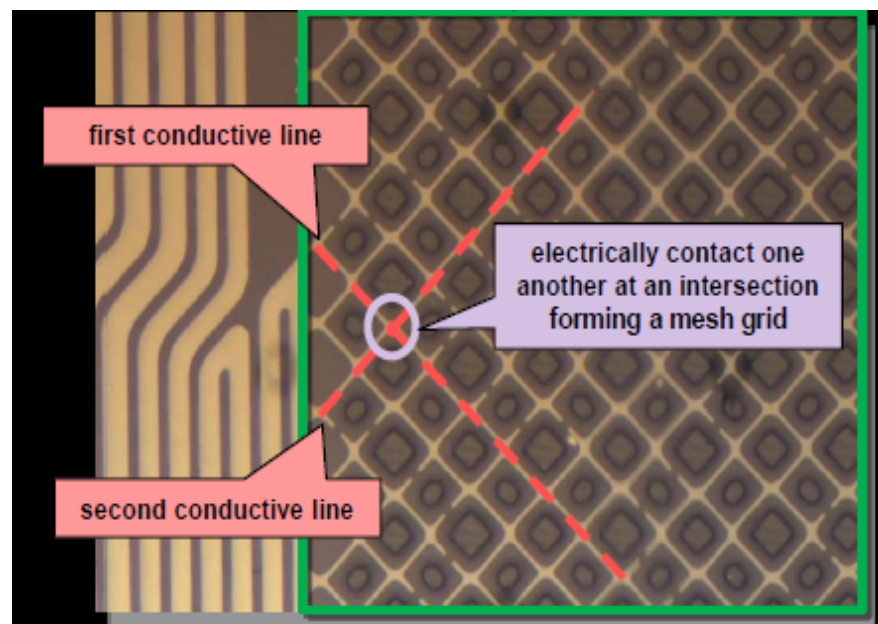
In the '311 Accused Instrumentalities, the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate. For example, the Samsung Galaxy S9 contains tracking disposed on the substantially flexible substrate, which provides drive or sense connections to or from the drive or sense electrodes:



*Claim Element**'311 Accused Instrumentalities*

10. The device of claim 7, wherein the touch sensor comprises:
a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or
a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

In the '311 Accused Instrumentalities, the touch sensor comprises a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface. For example, the Samsung Galaxy S9 comprises a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate:

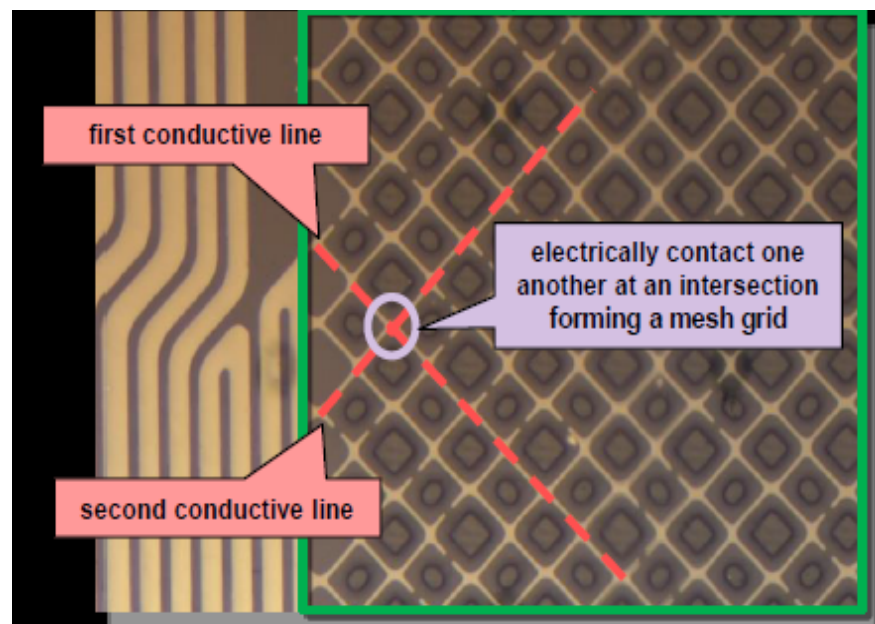


Claim Element

'311 Accused Instrumentalities

11. The device of claim 7, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

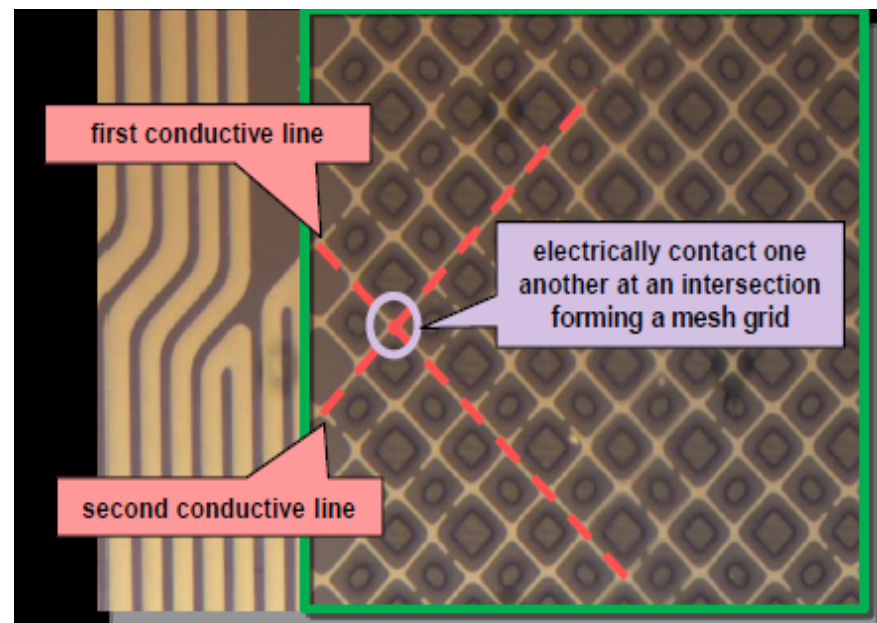
In the '311 Accused Instrumentalities, the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor. For example, the Samsung Galaxy S9 comprises a mutual-capacitance touch sensor:



*Claim Element**'311 Accused Instrumentalities*

12. The device of claim 7, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

In the '311 Accused Instrumentalities, the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh. For example, in the Samsung Galaxy S9 the drive or sense electrodes are made from flexible metal mesh. This flexible metal mesh includes electrically-isolated conductive metal lines that physically intersect (and thus electrically contact) to form a mesh grid:

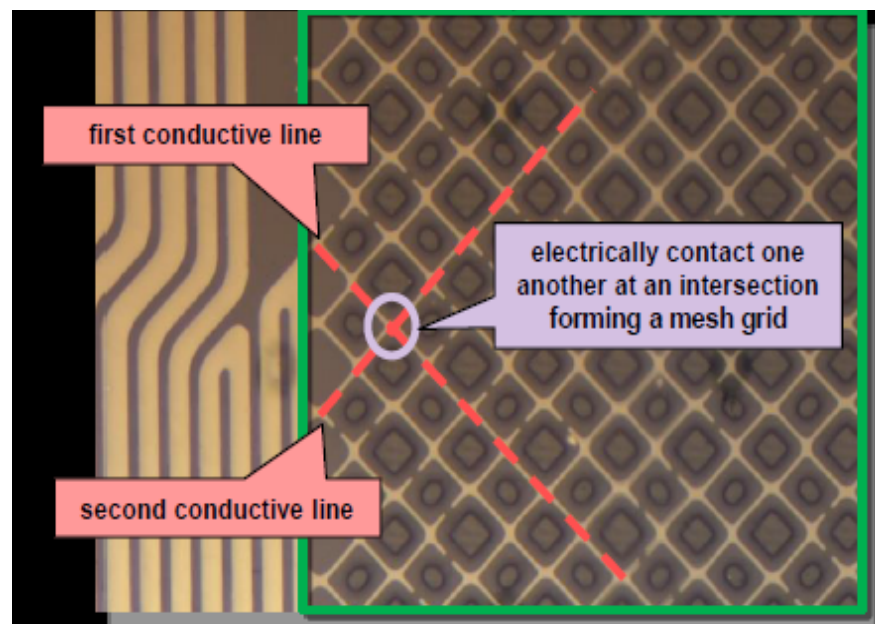


Claim Element

'311 Accused Instrumentalities

13. The apparatus of claim 1, wherein the first and second conductive lines are substantially orthogonal to one another.

In the '311 Accused Instrumentalities, the first and second conductive lines are substantially orthogonal to one another. For example, in the Samsung Galaxy S9 the first and second conductive lines are substantially orthogonal to one another:

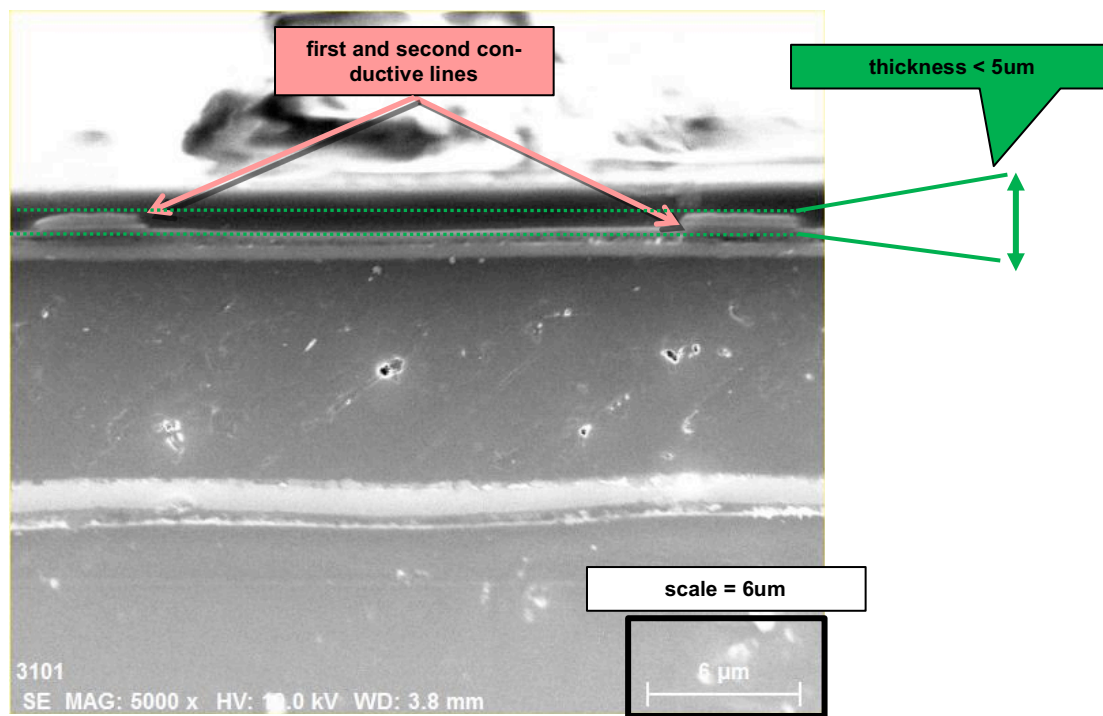


Claim Element

15. The apparatus of claim 1, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

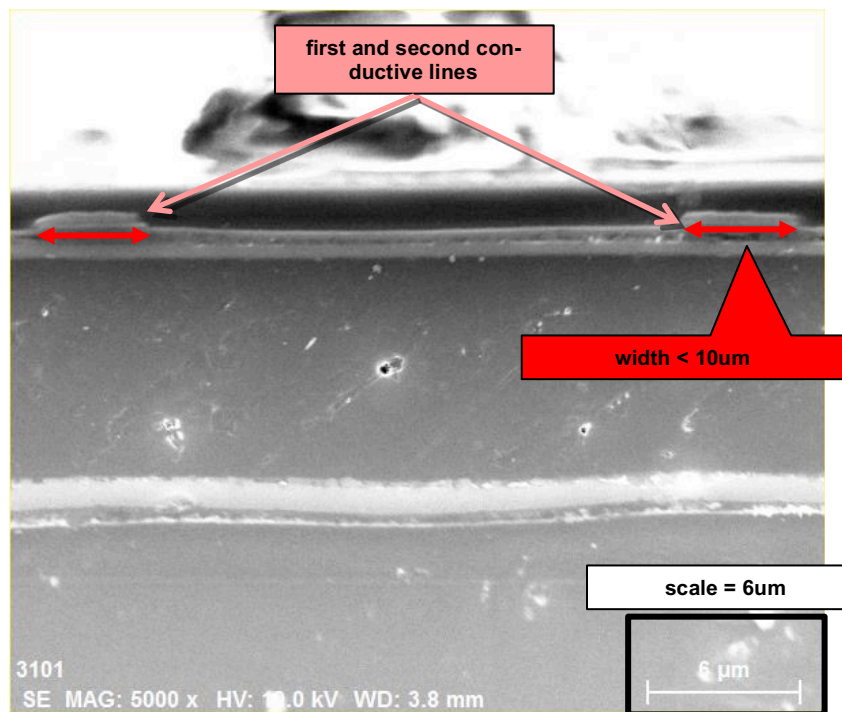
'311 Accused Instrumentalities

In the '311 Accused Instrumentalities, the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less. For example, in the Samsung Galaxy S9 the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less:



Claim Element

'311 Accused Instrumentalities

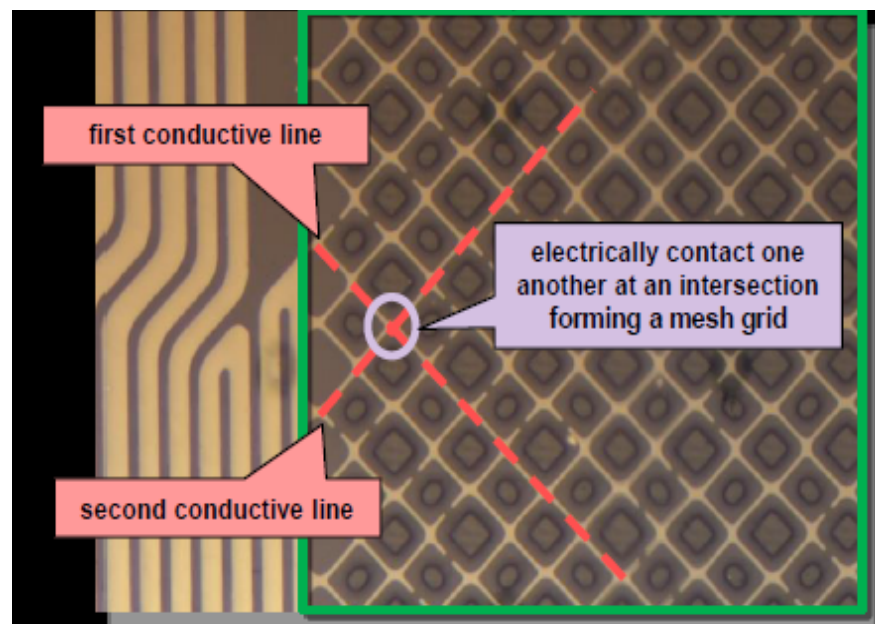


Claim Element

'311 Accused Instrumentalities

16. The device of claim 7, wherein the first and second conductive lines are substantially orthogonal to one another.

In the '311 Accused Instrumentalities, the first and second conductive lines are substantially orthogonal to one another. For example, in the Samsung Galaxy S9 the first and second conductive lines are substantially orthogonal to one another:

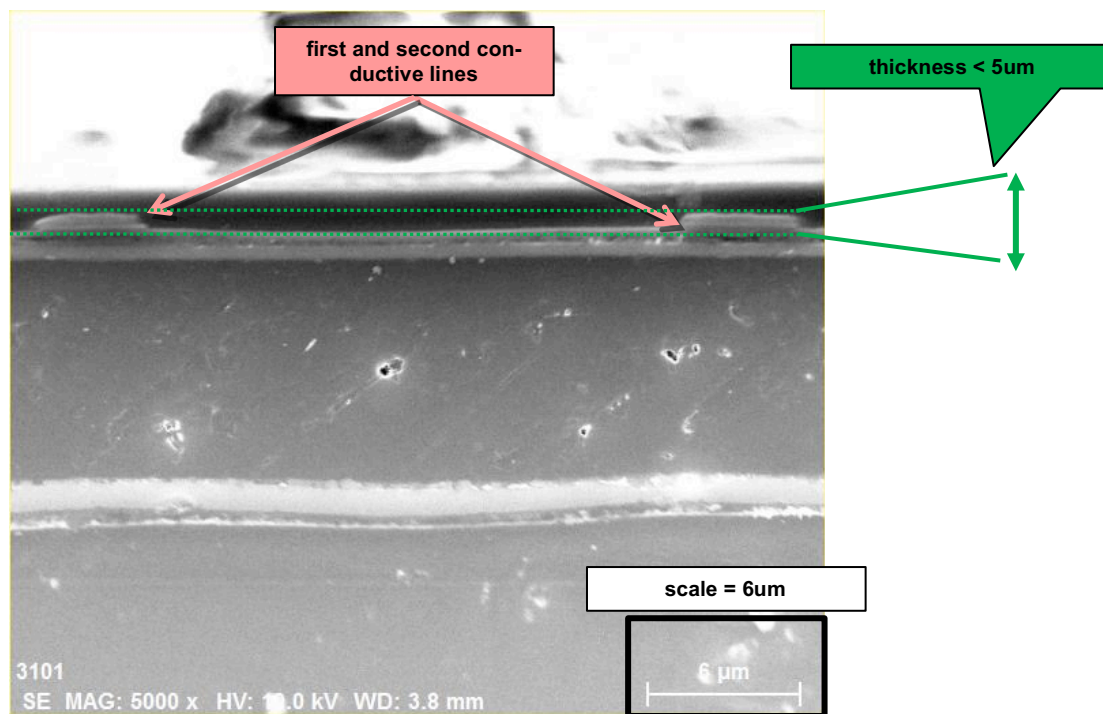


Claim Element

18. The device of claim 7, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

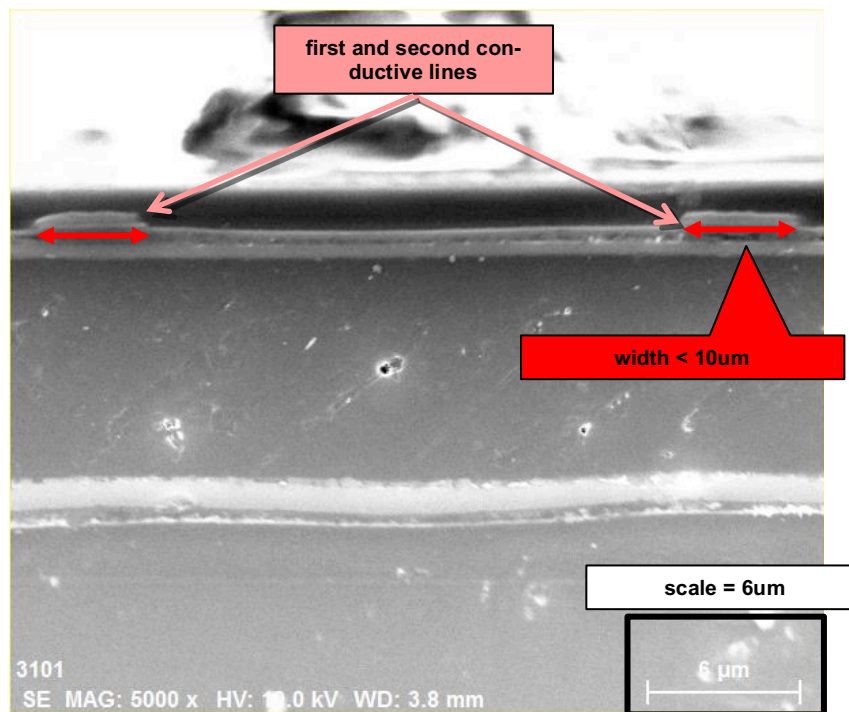
'311 Accused Instrumentalities

In the '311 Accused Instrumentalities, the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less. For example, in the Samsung Galaxy S9 the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less:



Claim Element

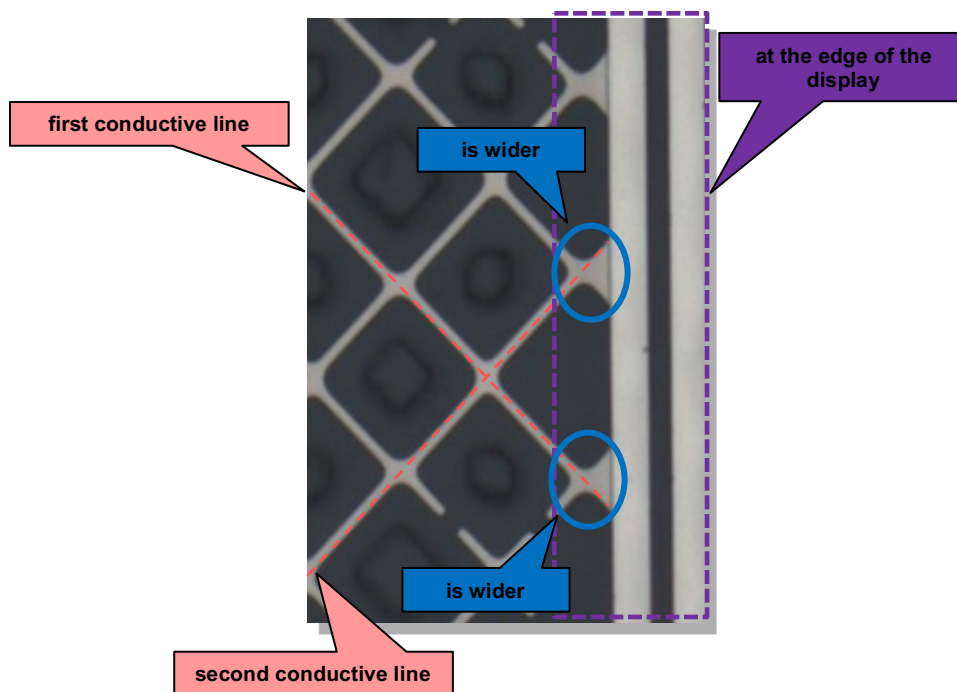
'311 Accused Instrumentalities



*Claim Element**'311 Accused Instrumentalities*

19. The apparatus of claim 1, wherein the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display.

In the '311 Accused Instrumentalities, the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display. For example, in the Samsung Galaxy S9, the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display, including at the edge shown below:



*Claim Element**'311 Accused Instrumentalities*

20. The device of claim 7, wherein the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display.

In the '311 Accused Instrumentalities, the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display, including at the edge shown below:

